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Draft Environmental Restoration RFCA Standard Operating Protocol for Routine Soil Remediation

• Environmental Restoration •
Rocky Flats Environmental Technology Site

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For Routine Soil Remediation

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EXECUTIVE SUMMARY

The Environmental Restoration (ER) Rocky Flats Cleanup Agreement (RFCA) Standard Operating Protocol (RSOP) for Routine Soil Remediation (ER RSOP) addresses routine remediation of soil and associated debris at Individual Hazardous Substance Sites (IHSSs), Potential Areas of Concern (PACs), Under Building Contamination (UBC) sites, and other areas, as necessary, at the Rocky Flats Environmental Technology Site (RFETS). Routine remediation of soil and buried debris will primarily be excavation and offsite disposal, with offsite treatment as required to meet regulatory and receiver site requirements.

This ER RSOP does not address remediation at the Present Landfill, Original Landfill, Solar Evaporation Ponds (SEP), 903 Lip Area and Americium Zone, groundwater contaminant plumes, and other nonroutine remediations. These projects will be addressed in separate decision documents.

The ER RSOP will:

- Provide a consistent approach to accelerated action decisions and remediation activities, which will enhance safety, quality, and compliance;
- Streamline the decisionmaking process by relying on one decision document instead of many; and
- Accelerate remediation schedules by eliminating numerous review cycles.

There are more than 200 potential release sites in the RFETS Buffer Zone (BZ) and Industrial Area (IA). These sites are being considered for routine remediation under this RSOP because (1) the sites have similar potential contaminants of concern that consist of radionuclides, organic compounds, or metals; (2) the sites may have debris (pipelines, wood, concrete, asphalt, drums, metal, plastics, rubber, fiberglass, or other debris) associated with the soil; (3) contamination is limited to surface or subsurface soil contamination; (4) subsurface soil can be associated with UBC sites and pipelines; (5) remediation of these sites does not require special engineering designs; and (6) these sites can be remediated by excavation and shipment of waste to offsite locations. The ER RSOP also covers foundation drains; tanks; and asphalt and concrete that is part of roads, parking lots, and orphan slabs.

The ER RSOP remediation process starts after characterization of the potential release sites. RFETS staff, in consultation with the regulatory agencies, review the characterization data, and a decision is made whether and how much site remediation is required. The remediation activities are planned through the Integrated Safety Management System (ISMS). Excavation of soil and debris is conducted in conjunction with "in-process" sampling to determine when remediation goals are achieved. The excavated soil and debris are segregated by waste type for disposal. This process results in an efficient, almost real-time implementation of characterization and

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remediation activities. Confirmation sampling will verify that remediation goals are met. All excavations will be backfilled, stabilized, and revegetated.

Supporting information provided in this RSOP include regulatory requirements and requirements and processes for environmental protection, work control, waste management provisions, decision management, health and safety (H&S) and quality assurance (QA).

RFCA mandates the incorporation of National Environmental Policy Act (NEPA) values into RFETS decision documents. This ER RSOP describes potential environmental impacts that may be associated with activities covered under this RSOP and satisfies the RFCA requirement for a "NEPA-equivalency" assessment of environmental consequences.

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ACRONYMS

ACM	asbestos-containing material
AL	action level
ALARA	As Low As Reasonably Achievable
ALF	Action Levels and Standards Framework for Surface Water, Ground Water, and Soils
Am	americium
AME	Actinide Migration Evaluation
AOC	Area of Concern
APEN	Air Pollution Emission Notice
AR	Administrative Record
ARAR	Applicable or Relevant and Appropriate Requirement
ASD	Analytical Services Division
bgs	below ground surface
BMP	best management practice
BS	building sump
BZ	Buffer Zone
BZSAP	Buffer Zone Sampling and Analysis Plan
CAD/ROD	Corrective Action Decision/Record of Decision
CAQCC	Colorado Air Quality Control Commission
CCR	Code of Colorado Regulations
CDPHE	Colorado Department of Public Health and Environment
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
CID	Cumulative Impacts Document
CHWA	Colorado Hazardous Waste Act
cm/sec	centimeters per second
CMS/FS	Corrective Measure Study/Feasibility Study
CO	carbon monoxide
COC	contaminant of concern
cpm	counts per minute
CRA	Comprehensive Risk Assessment
CRZ	Contaminant Reduction Zone
CSR	Customer Service Representative
CWA	Clean Water Act
DAC	Derived Air Concentration
DNAPL	dense non-aqueous phase liquids
DOE	U.S. Department of Energy
DOP	Decommissioning Operations Plan
DOT	United States Department of Transportation
dpm	disintegrations per minute
DPP	Decommissioning Program Plan
DQO	Data Quality Objective
EDD	Electronic Data Deliverable

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EDDIE	Environmental Data Dynamic Information Exchange
EDE	effective dose equivalent
EPA	U.S. Environmental Protection Agency
ER	Environmental Restoration
ER RSOP	ER RSOP for Routine Soil Remediation
ESA	Endangered Species Act
EZ/SCA	Exclusion Zone/Soil Containment Area
FD	foundation drain
FIDLER	field instrument for the detection of low energy radiation
FIP	Field Implementation Plan
ft	feet
ft^2	square feet
ft/sec	feet per second
FWPCA	Federal Water Pollution Control Act
FY	fiscal year
GIS	Geographic Information System
GPS	Global Positioning System
H&S	Health and Safety
HAP	hazardous air pollutant
HASP	Health and Safety Plan
HI	hazard index
HPGe	high-purity germanium
HRR	Historical Release Report
IA Strategy	Industrial Area Characterization and Remediation Strategy
IA	Industrial Area
IAG	Interagency Agreement
IASAP	Industrial Area Sampling and Analysis Plan
IDC	Item Description Code
IDW	inverse distance weighting
IGD	Implementation Guidance Document
IHSS	Individual Hazardous Substance Site
IM/IRA	Interim Measure/Interim Remedial Action
IMP	Integrated Monitoring Plan
ISMS	Integrated Safety Management System
IWCP	Integrated Work Control Program
JHA	Job Hazard Analysis
K-H	Kaiser-Hill Company, L.L.C.
L-A	Labat-Anderson
LCDB	Land Configuration Design Basis
LDR	Land Disposal Restriction
LHSU	lower hydrostratigraphic unit
LL	low-level
LLM	low-level mixed
LNAPL	light non-aqueous phase liquid
LRA	Lead Regulatory Agency
m^3	cubic meters

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mrem	millirem
mrem/yr	millirems per year
NAAQS	National Ambient Air Quality Standard
nCi/g	nanocurie per gram
NEPA	National Environmental Policy Act
NESHAPS	National Emission Standards for Hazardous Air Pollutants
NOx	oxides of nitrogen
NPDES	National Pollutant Discharge Act
NPWL	New Process Waste Line
NSD	new source detection
NSR	New Source Review
NTS	Nevada Test Site
OPWL	Original Process Waste Line
OSHA	Occupational Safety and Health Act
OU	Operable Unit
PAC	Potential Area of Concern
PAM	Proposed Action Memorandum
PATS	Plant Action Tracking System
PCB	polychlorinated biphenyl
PCOC	potential contaminant of concern
PM	particulate matter
PMJM	Preble's meadow jumping mouse
POE	point of evaluation
PPE	personal protective equipment
ppm	parts per million
PSD	Prevention of Significant Deterioration
Pu	plutonium
PU&D	Property Utilization and Disposal
QA	Quality Assurance
QAPjP	Quality Assurance Project Plan
QC	Quality Control
RAAMP	Radioactive Ambient Air Monitoring Program
RACT	Reasonably Available Control Technologies
RADMS	Remedial Action Decision Management System
RADP	Remedial Action Decontamination Pad
RAO	Remedial Action Objective
RBZ	Radiologic Buffer Zone
RCRA	Resource Conservation and Recovery Act
RCT	Radiological Control Technician
RFCA	Rocky Flats Cleanup Agreement
RFCAB	Rocky Flats Citizen Advisory Board
RFCoLG	Rocky Flats Coalition of Local Governments
RFETS (or "Site")	Rocky Flats Environmental Technology Site
RFFO	Rocky Flats Field Office
RFI/RI	RCRA Facility Investigation/Remedial Investigation
RSAL	Radionuclide Soil Action Level

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RSOP	RFCA Standard Operating Protocol
RSP	Radiological Safety Practices
RWP	Radiological Work Permit
SAP	Sampling and Analysis Plan
SCO	surface-contaminated object
SEP	Solar Evaporation Ponds
SID	South Interceptor Ditch
SNM	Special Nuclear Material
SOP	Standard Operating Procedure
SOW	Statement of Work
STP	Sewage Treatment Plant
SVOC	semi-volatile organic compound
SWD	Soil Water Database
SWWB	Site-Wide Water Balance
TPH	total petroleum hydrocarbon
TRU	transuranic
TSCA	Toxic Substance Control Act
TSP	total suspended particulate
U	uranium
UBC	Under Building Contamination
UCL	upper confidence limit
UHSU	upper hydrostratigraphic unit
UST	underground storage tank
VOC	volatile organic compound
WEMS	Waste and Environmental Management System
WGI	Waste Generating Instruction
WIPP	Waste Isolation Pilot Plant
WRE	waste release evaluation

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1.0 INTRODUCTION

Nearly 40 years of nuclear weapons production at the Rocky Flats Environmental Technology site (RFETS or Site) resulted in soil and debris potentially contaminated with chemical and radioactive substances, which may pose a hazard to human health and the environment. Potential contaminants of concern (PCOCs) in soil and debris are related to plutonium (Pu) and uranium (U) processing activities and associated support facilities and functions. The location and nature of processes that contributed to the potential releases are well documented. From existing data and process knowledge, PCOCs associated with past operations are fairly well understood and are similar at many release sites. PCOCs include radionuclides, metals, volatile organic compounds (VOCs), and semivolatile organic compounds (SVOCs).

Potential soil and debris (pipelines, wood, concrete, asphalt, drums, metal, plastic, rubber, fiberglass, or other debris) contamination from past operations at RFETS may exist in a number of configurations, including surface contamination (within top 6 inches); subsurface contamination (below top 6 inches but without structural complications); contamination under building floor slabs; and subsurface contamination associated with process waste pipelines, storm drains, and sanitary sewer lines. Regardless of the configuration, remediation options for contaminated soil and debris are limited because of technical feasibility constraints related to effectiveness, implementability, and cost.

The Environmental Restoration (ER) Rocky Flats Cleanup Agreement (RFCA) Standard Operating Protocol (RSOP) for Routine Soil Remediation (ER RSOP) addresses routine remediation of soil and associated debris at Individual Hazardous Substance Sites (IHSSs), Potential Areas of Concern (PACs), Under Building Contamination (UBC) sites, and other areas, as necessary, at RFETS. The following routine actions are described in this RSOP:

- Excavation of soil contaminated above agreed upon Action Levels (ALs) and associated debris, offsite disposal with or without offsite treatment; and

- Excavation of soil contaminated above agreed upon ALs and associated debris, onsite thermal desorption treatment of VOC-contaminated soil, and onsite backfilling or offsite disposal.

Routine remediation of contaminated soil and buried debris will primarily consist of excavation and offsite disposal, with offsite treatment as required to meet regulatory and disposal site requirements. The ER RSOP also provides for onsite treatment using thermal desorption, with soil backfilling if the treated soil will meet onsite backfill criteria and thermal desorption is economically favorable and protective of human health and the environment. Routine remediation of contaminated pipelines, drains, slabs, and foundations will primarily consist of excavation and offsite disposal. Consistent with previous remediations and investigations, it is anticipated that most contaminated soil and debris will be low-level (LL), low-level mixed (LLM), or hazardous waste. Nonroutine sanitary waste and small amounts of transuranic (TRU) and TRU-mixed waste may also be found.

This ER RSOP does not address remediation at the Present Landfill, Original Landfill, Solar Evaporation Ponds (SEP), 903 Lip Area and Americium Zone, groundwater contaminant plumes,

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and other nonroutine remediations. These projects will be addressed in separate decision documents.

The ER RSOP provides for the interim cleanup of soil and debris and is consistent with the long-term remediation objectives of leaving RFETS in a condition that is protective of human health and the environment and allows future land uses consistent with the Rocky Flats Vision. While the final cleanup levels and long-term monitoring requirements will be determined in the Corrective Action Decision/Record of Decision (CAD/ROD), it is anticipated that the Comprehensive Risk Assessment (CRA) will show that no further action is required at sites covered under this RSOP. Long-term monitoring requirements will integrate Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) and Resource Conservation and Recovery Act (RCRA) requirements with CRA requirements. Post-remediation stewardship of remediated areas will include routine monitoring under the Integrated Monitoring Plan (IMP) (DOE 2000a), maintenance of revegetated areas, and if necessary, additional monitoring around in-place stabilization remediation. Because the RSOP addresses accelerated actions, long-term stewardship activities cannot be fully addressed at this time. Long-term stewardship activities will be described in the RFETS Stewardship Plan (in preparation).

1.1 PURPOSE AND GOALS

The purpose of the ER RSOP is to serve as the decision document for routine soil and debris remediation at RFETS. This RSOP addresses soil accelerated action decisions and routine remediation processes for surface and subsurface soil and debris.

The goal of the ER RSOP is to provide for safe and effective accelerated actions to address risks posed by contaminated soil and debris in IHSSs, PACs, and UBC sites at RFETS. To meet this goal the following actions will be implemented through the ER RSOP:

- Define a process for implementing soil and associated debris remediation that:
    - Protects human health and the environment,
    - Meets RFCA cleanup goals,
    - Minimizes generation of waste,
    - Favors offsite disposal of wastes, and
    - Is cost effective;
- Coordinate remediation with the decommissioning schedule;
- Use the RFCA consultative process for accelerated action decisions;
- Ensure that remediation does not pose unacceptable risks to workers or the public; and
- Provide documentation for closure of IHSSs and PACs that are also RCRA units.

1.2 REGULATORY FRAMEWORK

RFCA, signed by the U.S. Department of Energy (DOE), Colorado Department of Public Health and Environment (CDPHE), and U.S. Environmental Protection Agency (EPA) (the RFCA Parties), on July 19, 1996, provides the regulatory framework for the cleanup of RFETS (DOE et al. 1996). RFCA streamlines remediation of the Site through accelerated actions that include characterization, remediation, and closure of IHSSs, PACs, and UBC sites at RFETS.

RFCA provides the regulatory framework for DOE response obligations under CERCLA and corrective action obligations under RCRA. The RFCA accelerated action process incorporates the requirements of CERCLA and RCRA. After accelerated actions are complete, DOE will develop a RCRA Facility Investigation/Remedial Investigation (RFI/RI) to describe the completed actions and a CRA to verify that potential contamination remaining at RFETS is within acceptable risk levels as defined by CERCLA and implemented through RFCA. DOE will also develop a CAD/ROD that will include the final action, post-closure monitoring and operation requirements, including five-year reviews of the Site to evaluate whether the remedies, including any institutional controls, are effective.

Attachment 5 to RFCA, Action Levels and Standards Framework for Surface Water, Ground Water, and Soils (ALF) provides the rationale and numeric ALs for surface soil. As stated in the ALF, ALs "are numeric levels that, when exceeded, trigger an evaluation, remedial action, and/or management action" (DOE et al. 1996). Surface soil interim cleanup levels are equal to Tier I ALs unless protection of surface water requires a greater level of cleanup. Subsurface soil interim cleanup goals are equal to the agreed upon cleanup levels. While final cleanup levels will be determined in the CAD/ROD, it is anticipated that the interim cleanup will meet the final cleanup requirements.

During the remediation process, personnel from the DOE Rocky Flats Field Office (RFFO), its contractor, Kaiser-Hill Company, L.L.C. (K-H), CDPHE, and EPA will use the RFCA consultative process to establish and maintain effective working relationships with each other and with the general public.

1.3 ER RSOP MODIFICATIONS

This ER RSOP follows the RSOP approach outlined in RFCA and the Implementation Guidance Document (IGD) (DOE et al. 1999). As this RSOP is implemented through Site closure, new information may require that the document be modified. Modifications to this RSOP will be designated sequentially beginning with "Modification 1" and will be placed in the Administrative Record (AR) and in Appendix A of this document.

1.4 ER RSOP NOTIFICATION LETTER

After the regulatory agencies approve this RSOP, no further formal approvals are required. DOE will notify the Lead Regulatory Agency (LRA) prior to implementing this RSOP for each specific project. A Notification Letter will be prepared at the beginning of the fiscal year and as the need to remediate arises. A map of potential remediation targets and contaminants of concern (COCs) and a list of documents making up the AR file for the individual project will be included in the Notification Letter. The Notification Letter will become part of the AR and will also be placed in Appendix B of this document.

1.5 RFCA CONSULTATIVE PROCESS

The RFCA consultative process will be used throughout the ER remediation process during planning and at decision points. Figure 1 illustrates the overall remediation process and where regulatory agency consultation is expected. As shown on Figure 1, regulatory agencies will be part of the decision process starting with developing the overall remediation strategy and continuing through all decision making phases. Regulatory agency consultation will occur during the following activities:

- Evaluation of existing characterization data;
- Location of characterization sampling points;
- Development of the Notification Letter;
- Location of remediation areas and identification of COCs;
- Determination whether remedial objectives have been achieved; and
- Location of confirmation sampling locations.

Because DOE and K-H will use the RFCA consultative process throughout the remediation process, opportunities for consultation are highlighted on activity, decision, and process flow diagrams throughout this RSOP.

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2.0 SITE DESCRIPTION

RFETS is located approximately 16 miles northwest of Denver, Colorado, in northern Jefferson County. The Site occupies approximately 10 square miles. Boundaries and major features are illustrated on Figure 2. Most of the buildings are located within an industrial complex of approximately 350 acres (the Industrial Area [IA]) surrounded by a Buffer Zone (BZ) of approximately 6,150 acres.

Materials defined as hazardous substances by CERCLA, as well as those defined as hazardous constituents by RCRA or the Colorado Hazardous Waste Act (CHWA), or as toxic substances as defined by the Toxic Substances Control Act (TSCA) may have been released to the environment at various locations across RFETS. Potential release sites covered under this RSOP are listed in Table 1.

Potential releases were identified at 194 IHSSs, PACs, UBC sites, and tanks in the IA, as illustrated on Figure 3. The IA contains 400 buildings along with other structures, roads, and utilities, and is where the bulk of RFETS mission activities took place between 1951 and 1989 (DOE et al. 1996). Most of the buildings and associated structures were used for processing activities associated with weapons production. Descriptions of potential release sites are found in Appendix C of the Final Industrial Area Sampling and Analysis Plan (IASAP) (DOE 2001a). In the BZ, potential releases were identified at 42 IHSSs and PACs, as illustrated on Figure 4. The BZ contained support functions, disposal areas, and undisturbed buffer areas. Descriptions of historical operations in the BZ are presented in Appendix C of the Draft Buffer Zone Sampling and Analysis Plan (BZSAP) (DOE 2001b).

Descriptions of historical operations and releases in the IA and BZ are also presented in the Historical Release Report (HRR) (DOE 1992) and quarterly and annual updates (DOE 1993 through 2000).

Before RFCA went into effect, the IHSSs were grouped into 16 Operable Units (OUs) as part of the Interagency Agreement (IAG). The OU consolidation prior to RFCA established the BZ and IA OUs and left the original OUs 1, 3, and 7 intact. OUs 5 and 6 remain in place with minor modifications. The 236 IHSSs, PACs, UBC sites and associated tanks were further consolidated into 58 IA Groups (Figure 3) and 8 BZ Groups (Figure 4) as part of the 1999 IA Characterization and Remediation Strategy (IA Strategy) (DOE 1999a) and the Closure Project Baseline. Table 1 lists the pre-RFCA OUs, IHSSs, PACs, UBC sites, and tanks in the IA and BZ OUs. Descriptions of IHSSs, PACs, and UBC sites, based on previous studies, are included in the Final IASAP (DOE 2001a) and Draft BZSAP (DOE 2001b).

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Table 1
Potential Release Sites

IHSS Group	Old Operable Unit No.	Current Operable Unit	Description	IHSS/PAC/UBC Site	Area (ft^2)	Historical Notes
000-2	OU 9	IA	Original Process Waste Lines (OPWL)	000-121		Underground network pipes/tanks; multiple breaks and leaks
	OU 9	IA	Valve Vault West of Building 707	700-123.2	2,476	Process waste migration along containment pipe and into ditch
	N/A	IA	Building 123 Process Waste Line Break	100-602	14,514	Line, valve vault, bedding material (conduit) between Buildings 123 and 443
	OU 9	IA	Tank 29 – OPWL	000-121		Aboveground waste process tank; possible leaks
	OU 9	IA	Tank 31 – OPWL	000-121		Below grade, open top sewage tank
	OU 9	IA	Low-Level Radioactive Waste Leak	700-127	2,500	Multiple line breaks and leaks
	OU 9	IA	Process Waste Line Leaks	700-147.1	16,427	Multiple line breaks and leaks; diverse release paths
	OU 14	IA	Radioactive Site 700 Area	700-162	141,294	Residual hot spots along 8th Street
000-3	N/A	IA	Sanitary Sewer System	000-500		Routine and incidental waste discharges to sinks, sumps, lines
	N/A	IA	Storm Drains	000-505		
	OU 6	IA	Old Outfall – Building 771	700-143	6,167	Contaminated waste water outfall area; one hot spot in nearby culvert
	OU 13	IA	Central Avenue Ditch Caustic Leak	000-190	186,016	Caustic release to Central Ave. Ditch, Walnut Creek, and B-1
000-4	N/A	IA	New Process Waste Line (NPWL)	000-504		
100-1	N/A	IA	UBC 122 – Medical Facility	UBC 122	9,768	Drum leaks and possible line leaks
	OU 9	IA	Tank 1 — OPWL – Underground Stainless Steel Waste Storage Tank	000-121		Overflows and leaks from underground tank
100-2	N/A	IA	UBC 125 — Standards Laboratory	UBC 125	17,736	Possible spills from calibration lab (mercury)
100-3	N/A	IA	Building 111 Transformer polychlorinated biphenyl (PCB) Leak	100-607	356	Transformer leak
100-4	OU 13	IA	UBC 123 – Health Physics Laboratory	UBC 123	18,885	Disposal out windows & waste line leaks
	N/A	IA	Waste Leaks	100-148	14,143	Unlocated waste spills, OPWL leaks
	N/A	IA	Building 123 Bioassay Waste Spill	100-603	356	OPWL leaks
	N/A	IA	Building 123 Scrubber Solution Spill	100-611	294	Process waste leak
100-5	N/A	IA	Building 121 Security Incinerator	100-609	599	Incinerator; accepted PCB-laden paper
300-1	OU 13	IA	Oil Burn Pit #1	300-128	914	Burn and airborne contamination area
	OU 13	IA	Lithium Metal Site	300-134(N)	7,126	Burn area
	OU 13	IA	Solvent Burning Grounds	300-171	11,412	Burn area
300-2	N/A	IA	UBC 331 – Maintenance	UBC 331	4,986	Possible spills from maintenance activities
	OU 13	IA	Lithium Metal Destruction Site	300-134(S)	23,728	Lithium burn areas (2)
300-3	N/A	IA	UBC 371 – Plutonium Recovery	UBC 371	114,147	Known spills of wastewater and process solutions
300-4	N/A	IA	UBC 374 – Waste Treatment Facility	UBC 374	27,131	Multiple spills and potential leaks from waste lines
300-5	OU 10	IA	Inactive D-836 Hazardous Waste Tank	300-206	627	Condensate water spill from line to tank
300-6	N/A	IA	Pesticide Shed	300-702	4,380	Herbicide/pesticide spills/leaks in shed and surrounding area
400-1	N/A	IA	UBC 439 – Radiological Survey	UBC 439	5,107	Possible spills from machining operations

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IHSS Group	Old Operable Unit No.	Current Operable Unit	Description	IHSS/PAC/UBC Site	Area (ft^2)	Historical Notes
400-2	N/A	IA	UBC 440 – Modification Center	UBC 440	40,166	Possible spills from machining operations
400-3	N/A	IA	UBC 444 – Fabrication Facility	UBC 444	123,113	Overflows and leaks of process solutions
	N/A	IA	UBC 447 – Fabrication Facility	UBC 447	19,182	Possible spills and leaks from ongoing processes
	OU 12	IA	West Loading Dock Building 447	400-116.1	2,009	Spills and leaks impacted soil and groundwater beneath dock
	OU 12	IA	Cooling Tower Pond West of Building 444	400-136.1	7,654	Evaporation holding pond
	OU 12	IA	Cooling Tower Pond East of Building 444	400-136.2	7,097	Cooling tower blowdown pond
	OU 10	IA	Buildings 444/453 Drum Storage	400-182	3,465	Leaking drums and oil spills
	OU 10	IA	Inactive Building 444 Acid Dumpster	400-207	1,288	Known spills to containment berm (possible leakage)
	OU 10	IA	Inactive Buildings 444/447 Waste Storage Site	400-208	864	Possible leakage from drum storage
	N/A	IA	Transformer, Roof of Building 447	400-801	1,597	Transformer leakage via downspouts possibly to storm drain
	N/A	IA	Beryllium Fire - Building 444	400-810	15,073	Drainage, holding basin and airborne contamination from fire
	OU 9	IA	Tank 4 – OPWL Process Waste Pits	000-121		Potential leaks and overflows
	OU 9	IA	Tank 5 – OPWL Process Waste Tanks	000-121		Potential leaks and overflows
	OU 9	IA	Tank 6 – OPWL Process Waste Floor Sump and Foundation Drain Floor	000-121		Potential leaks and overflows
	OU 12	IA	South Loading Dock Building 444	400-116.2	1,113	Windblown, drum leakage, dumping
400-4	N/A	IA	Miscellaneous Dumping, Building 460 Storm Drain	400-803	18,932	Dumping to storm drain, extends along open ditch
	N/A	IA	Road North of Building 460	400-804	1,393	Hot spots covered w/asphalt from falling ingots
400-5	OU 10	IA	Sump #3 Acid Site (Southeast of Building 460)	400-205	1,693	Leakage from container overflows in berm area
	N/A	IA	RCRA Tank Leak in Building 460	400-813	356	Pipe leakage beneath building
	N/A	IA	RCRA Tank Leak in Building 460	400-815	356	Possible leakage from spills to secondary containment
400-6	OU 12	IA	Radioactive Site South Area	400-157.2	438,409	Dumping, surface runoff, air releases, open surface storage
400-7	N/A	IA	UBC 442 – Filter Test Facility	UBC 442	2,583	Leaking barrels, discharges
	OU 13	IA	Radioactive Site North Area	400-157.1	51,169	Leaking drums, drainage to ditches
	OU 10	IA	Building 443 Oil Leak	400-129	6,434	Leaks and spills from underground tanks (6)
	OU 12	IA	Sulfuric Acid Spill Building 443	400-187	20,206	Multiple leaks and sprays from storage tank
400-8	N/A	IA	UBC 441 – Office Building	UBC 441		
	OU 12	IA	Underground Concrete Tank	400-122		Overflows and leaking from tanks
	OU 9	IA	Tank 2 – Concrete Waste Storage Tank	000-121		Potential leaks and overflows
	OU 9	IA	Tank 3 – Concrete Waste and Steel Waste Storage Tanks	000-121		Potential leaks and overflows
400-10	N/A	IA	Sandblasting Area	400-807	9,583	Open air sandblasting

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IHSS Group	Old Operable Unit No.	Current Operable Unit	Description	IHSS/PAC/UBC Site	Area (ft²)	Historical Notes
	OU 12	IA	Fiberglass Area West of Building 664	600-120.2	5,449	Multiple spills around work area (resin and solvents)
	OU 14	IA	Radioactive Site West of Building 664	600-161	53,346	Punctured and leaking drums, hydraulic leaks
500-1	OU 13	IA	Valve Vaults 11, 12, 13	300-186	48,345	Leaks and discharges from transfer pipes and vaults
	OU 16	IA	Scrap Metal Storage Site	500-197	89,320	Residual contamination from removal of process and building scrap
	OU 13	IA	North Site Chemical Storage Site	500-117.1	115,489	Surface storage of contaminated material, uranium chips
500-2	OU 13	IA	Radioactive Site Building 551	500-158	62,166	Wastebox leakage, exterior contaminated drums transferred
500-3	N/A	IA	UBC 559 – Service Analytical Laboratory	UBC 559	34,544	Plutonium (Pu) waste line leaks and breaks
	N/A	IA	UBC 528 – Temporary Waste Holding Building	UBC 528	432	OPWL leaks/valve vault overflows
	OU 9	IA	Radioactive Site Building 559	500-159	5,363	Broken process waste lines
	OU 9	IA	Tank 7 – OPWL - Active Process Waste Pit	000-121		Potential leaks and overflows
	OU 9	IA	Tank 33 – OPWL - Process Waste Tank	000-121		Potential leaks and overflows
	OU 9	IA	Tank 34 – OPWL - Process Waste Tank	000-121		Potential leaks and overflows
	OU 9	IA	Tank 35 – OPWL - Building 561 Concrete Floor Sump	000-121		Potential leaks and overflows
500-4	OU 13	IA	Middle Site Chemical Storage	500-117.2	91,616	Minor leaks and spills, partial asphalt cover
500-5	N/A	IA	Transformer Leak - 558-1	500-904	356	PCB-oil leaks to concrete pad
500-6	N/A	IA	Asphalt Surface Near Building 559	500-906	356	1 gallon F001 spill from liquid hose transfer
500-7	N/A	IA	Tanker Truck Release of Hazardous Waste from Tank 231B	500-907	859	Liquid and solid sludge release to soil
600-1	N/A	IA	Temporary Waste Storage - Building 663	600-1001	42,803	Leaking, punctured, and spilled drums (concrete pad)
600-2	N/A	IA	Storage Shed South of Building 334	400-802	63,641	Leaking and spilled drums to concrete pad
600-3	OU 12	IA	Fiberglass Area North of Building 664	600-120.1	4,650	Multiple spills around work area
600-4	OU 14	IA	Radioactive Site Building 444 Parking Lot	600-160	143,752	Releases from drums and boxes stored on ground
600-5	N/A	IA	Central Avenue Ditch Cleaning	600-1004	14,885	Soil spreading from ditch to area around tanks
600-6	N/A	IA	Former Pesticide Storage Area	600-1005	356	Pesticide spills to dirt floor
700-1	N/A	IA	Identification of Diesel Fuel in Subsurface Soil	700-1115		Subsurface fuel leak
700-2	N/A	IA	UBC 707 – Plutonium Fabrication and Assembly	UBC 707	107,710	Process line leaks/breaks
	N/A	IA	UBC 731 – Building 707 Process Waste	UBC 731	4,000	Process spills/OPWL leaks and breaks
	OU 9	IA	Tank 11 – OPWL - Building 731	000-121		Potential leaks and overflows
	OU 9	IA	Tank 30 – OPWL - Building 731	000-121		Potential leaks and overflows
700-3	N/A	IA	UBC 776 – Original Plutonium Foundry	UBC 776	142,889	Airborne/tracked contamination fires and explosions/liquid waste spills

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IHSS Group	Old Operable Unit No.	Current Operable Unit	Description	IHSS/PAC/UBC Site	Area (ft^2)	Historical Notes
	N/A	IA	UBC 777 – General Plutonium Research and Development	UBC 777		Process spills/OPWL leaks/fire contamination
	N/A	IA	UBC 778 – Plant Laundry Facility	UBC 778	26,609	Laundry water spills/OPWL leaks and breaks
	N/A	IA	UBC 701 – Waste Treatment Research and Development	UBC 701	5,645	Possible spills from R&D lab
	OU 8	IA	Solvent Spills West of Building 730	700-118.1	246	Carbon tetrachloride overflows and line leaks
	OU 14	IA	Radioactive Site 700 Area No.1	700-131	7,072	Fire and explosion resulting in soil contamination
	OU 8	IA	Radioactive Site West of Building 771/776	700-150.2(S)	27,113	Airborne and tracked contamination from fire, cleanup, and rain
	OU 8	IA	Radioactive Site South of Building 776	700-150.7	18,589	Airborne and tracked contamination from fire, cleanup, and rain
	N/A	IA	French Drain North of Building 776/777	700-1100	1,567	Possible pathway for contamination from explosion and fire
	OU 9	IA	Tank 9 – OPWL – Two 22,500-Gallon Concrete Laundry Tanks	000-121		Potential leaks and overflows
	OU 9	IA	Tank 10 – OPWL – Two 4,500-Gallon Process Waste Tanks	000-121		Potential leaks and overflows
	OU 9	IA	Tank 18 – OPWL – Concrete Laundry Waste Lift Sump	000-121		Potential leaks and overflows
	OU 8	IA	Solvent Spills North of Building 707	700-118.2	633	Tank leaks and rupture
	OU 8	IA	Sewer Line Overflow	700-144(N)	1,710	Pressurized sewer line breaks & overflows
	OU 8	IA	Sewer Line Overflow	700-144(S)	2,330	Pressurized sewer line breaks & overflows
	N/A	IA	Transformer Leak South of Building 776	700-1116	356	Dielectric fluid leak to pad, gravel, and soil
	OU 8	IA	Radioactive Site Northwest of Building 750	700-150.4	394	Leaks and backups of stored decontamination fluid
700-4	N/A	IA	UBC 771 – Pu and americium (Am) Recovery Operations	UBC 771	97,553	Fire, sewer line breaks, process waste line leaks
	N/A	IA	UBC 774 – Liquid Process Waste Treatment	UBC 774	15,776	Tank overflows, drain breaks
	OU 8	IA	Radioactive Site West of Buildings 771/776	700-150.2(N)	27,113	Fire, explosion, tank overflows
	OU 8	IA	Radioactive Site 700 North of Building 774 (Area 3) Wash Area	700-163.1	18,613	Contaminated equipment wash area
	OU 8	IA	Radioactive Site 700 Area 3 Americium Slab	700-163.2	2,270	Buried contaminated (Am) slab 8'x8'x10"
	OU 9	IA	Abandoned Sump Near Building 774 Unit 55.13 T-40	700-215	960	Mixed waste storage tank
	OU 8	IA	Hydroxide Tank, KOH, NaOH Condensate	700-139(N)(b)	342	Overflows/spills from aboveground KOH/NaOH tanks
	OU 9	IA	30,000-Gallon Tank (68)	700-124.1	1,133	Overflows/leaks from tank
	OU 9	IA	14,000-Gallon Tank (66)	700-124.2		Overflows/leaks from tank
	OU 9	IA	14,000-Gallon Tank (67)	700-124.3		Overflows/leaks from tank
	OU 9	IA	Holding Tank	700-125		Tank overflows
	OU 9	IA	Westernmost Out-of-Service Process Waste Tank	700-126.1	383	Below grade leaks/overflows
	OU 9	IA	Easternmost Out-of-Service Process Waste Tank	700-126.2	370	Below grade leaks/overflows
	OU 9	IA	Tank 8 – OPWL – East and West Process Tanks	000-121		Potential leaks and overflows

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IHSS Group	Old Operable Unit No.	Current Operable Unit	Description	IHSS/PAC/UBC Site	Area (ft^2)	Historical Notes
	OU 9	IA	Tank 12 – OPWL – Two Abandoned 20,000-Gallon Underground Concrete Tanks	000-121		Potential leaks and overflows
	OU 9	IA	Tank 13 – OPWL – Abandoned Sump - 600 Gallons	000-121		Potential leaks and overflows
	OU 9	IA	Tank 14 – OPWL – 30,000-Gallon Concrete Underground Storage Tank (68)	000-121		Potential leaks and overflows
	OU 9	IA	Tank 15 – OPWL – Two 7,500-Gallon Process Waste Tanks (34W, 34E)	000-121		Potential leaks and overflows
	OU 9	IA	Tank 16 – OPWL – Two 30,000-Gallon Concrete Underground Storage Tanks (66, 67)	000-121		Potential leaks and overflows
	OU 9	IA	Tank 17 – OPWL – Four Concrete Process Waste Tanks (30, 31, 32, 33)	000-121		Potential leaks and overflows
	OU 9	IA	Tank 36 – OPWL – Steel Carbon Tetrachloride Sump	000-121		Potential leaks and overflows
	OU 9	IA	Tank 37 – OPWL – Steel-Lined Concrete Sump	000-121		Potential leaks and overflows
	OU 8	IA	Caustic/Acid Spills Hydrofluoric Tank	700-139.2	918	Spills & leaks infiltrated surrounding soil
	OU 9	IA	Concrete Process 7,500-Gallon Waste Tank (31)	700-146.1	1,507	Frequent tank overflows and leakage
	OU 9	IA	Concrete Process 7,500-Gallon Waste Tank (32)	700-146.2		Frequent tank overflows and leakage
	OU 9	IA	Concrete Process 7,500-Gallon Waste Tank (34W)	700-146.3		Frequent tank overflows and leakage
	OU 9	IA	Concrete Process 7,500-Gallon Waste Tank (34E)	700-146.4		Frequent tank overflows and leakage
	OU 9	IA	Concrete Process 7,500-Gallon Waste Tank (30)	700-146.5		Frequent tank overflows and leakage
	OU 9	IA	Concrete Process 7,500-Gallon Waste Tank (33)	700-146.6		Frequent tank overflows and leakage
	OU 8	IA	Radioactive Site North of Building 771	700-150.1	24,779	Airborne, leaking drums, tracked contamination
	OU 8	IA	Radioactive Site Between Buildings 771 and 774	700-150.3	5,037	Broken process waste line
700-5	N/A	IA	UBC 770 – Waste Storage Facility	UBC 770	3,111	Possible leakage from stored waste containers
700-6	OU 8	IA	Buildings 712/713 Cooling Tower Blowdown	700-137	14,962	Ground placement of tower sludge/blowdown water leaks
	OU 8	IA	Caustic/Acid Spills Hydroxide Tank Area	700-139.1(S)	923	Multiple spills and leaks
700-7	N/A	IA	UBC 779 – Main Plutonium Components Production Facility	UBC 779	43,360	Building over original Solar Pond/water spills & leaks
	OU 8	IA	Building 779 Cooling Tower Blowdown	700-138	14,962	Underground cooling tower water line break
	OU 8	IA	Radioactive Site South of Building 779	700-150.6	4,435	Tracked contamination
	OU 8	IA	Radioactive Site Northeast of Building B779	700-150.8	13,054	Tracked contamination
	N/A	IA	Transformer Leak - 779-1/779-2	700-1105	712	PCB oil released from transformer

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IHSS Group	Old Operable Unit No.	Current Operable Unit	Description	IHSS/PAC/UBC Site	Area (ft^2)	Historical Notes
	OU 9	IA	Tank 19 – OPWL - Two 1,000-Gallon Concrete Sumps	000-121		Potential leaks and overflows
	OU 9	IA	Tank 20 – OPWL - Two 8,000-Gallon Concrete Sumps	000-121		Potential leaks and overflows
	OU 9	IA	Tank 38 – OPWL - 1,000-Gallon Steel Tanks	000-121		Potential leaks and overflows
700-8	OU 10	IA	750 Pad – Pondcrete/Saltcrete Storage	700-214	139,658	Pondcrete/saltcrete spills/pad runoff not contained
700-10	N/A	IA	Laundry Tank Overflow – Building 732	700-1101	1,856	Wastewater tank overflow
700-11	N/A	IA	Bowman's Pond	700-1108	4,741	Tanks/process line leaks/footing drain accumulation area
	OU 8	IA	Hydroxide Tank, KOH, NaOH Condensate	700-139.1(N) (a)	2,520	Multiple spills and leaks
700-12	N/A	IA	Process Waste Spill – Portal 1	700-1106	356	Valve vault water spilled onto street
800-1	N/A	IA	UBC 865 – Materials Process Building	UBC 865	41,558	OPWL leaks/spills from coating ops and R&D activities
	N/A	IA	Building 866 Spills	800-1204	2,623	Vent pipe and tank overflows
	N/A	IA	Building 866 Sump Spill	800-1212	364	Leak from sump pump
	OU 9	IA	Tank 23 – OPWL	000-121		Potential leaks and overflows
800-2	N/A	IA	UBC 881 – Laboratory and Office	UBC 881	79,222	Multiple leaks/broken waste lines
	N/A	IA	Building 881, East Dock	800-1205	2,426	Possible unknown contamination/condensate spill
	OU 9	IA	Tank 24 – OPWL – Seven 2,700-Gallon Steel Process Waste Tanks	000-121		Potential leaks and overflows
	OU 9	IA	Tank 32 – OPWL – 131,160-Gallon Underground Concrete Secondary Containment Sump	000-121		Potential leaks and overflows
	OU 9	IA	Tank 39 – OPWL – Four 250-Gallon Steel Process Waste Tanks	000-121		Potential leaks and overflows
800-3	N/A	IA	UBC 883 - Roll and Form Building	UBC 883	49,325	Process waste water leaks & overflows
	N/A	IA	Valve Vault 2	800-1200	4,541	Transfer line leak
	OU 9	IA	Tank 25 – OPWL – 750-Gallon Steel Tanks (18, 19)	000-121		Potential leaks and overflows
	OU 9	IA	Tank 26 – OPWL – 750-Gallon Steel Tanks (24, 25, 26)	000-121		Potential leaks and overflows
	N/A	IA	Radioactive Site South of Building 883	800-1201	1,500	Multiple areas of contamination from Plant operations
800-4	N/A	IA	UBC 886 – Critical Mass Laboratory	UBC 886	13,517	Leaks and spills from criticality experiments
	OU 9	IA	Tank 21 – OPWL – 250-Gallon Concrete Sump	000-121		Potential leaks and overflows
	OU 9	IA	Tank 22 – OPWL – Two 250-Gallon Steel Tanks	000-121		Potential leaks and overflows
	OU 9	IA	Tank 27 – OPWL – 500-Gallon Portable Steel Tank	000-121	31,400	Potential leaks and overflows
	OU 14	IA	Radioactive Site #2 800 Area, Building 886 Spill	800-164.2	31,400	Tank leak
800-5	N/A	IA	UBC 887 – Process and Sanitary Waste Tanks	UBC 887	378	Leaks & breaks in process waste lines
	OU 10	IA	Building 885 Drum Storage	800-177	1,064	Possible releases from waste storage

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IHSS Group	Old Operable Unit No.	Current Operable Unit	Description	IHSS/PAC/UBC Site	Area (ft^2)	Historical Notes
800-6	N/A	IA	UBC 889 – Decontamination and Waste Reduction	UBC 889	2,603	Radiological car wash area/OPWL leaks/waste tank breaches
	OU 14	IA	Radioactive Site 800 Area Site #2 Building 889 Storage Pad	800-164.3	28,944	Leaks/spills/rainwater transport from storage area
	OU 9	IA	Tank 28 – Two 1,000-Gallon Concrete Sumps	000-121		Potential leaks and overflows
	OU 9	IA	Tank 40 – Two 400-Gallon Underground Concrete Tanks	000-121		Potential leaks and overflows
900-1	N/A	IA	UBC 991 – Weapons Assembly and R&D	UBC 991	59,849	Potential line leaks/valve vault breaches & overflows
	OU 8	IA	Radioactive Site Building 991	900-173	5,970	Small spills & equipment wash area
	OU 8	IA	Radioactive Site 991 Steam Cleaning Area	900-184	4,125	Equipment cleaning area
	N/A	IA	Building 991 Enclosed Area	900-1301	3,939	Possible leaks from waste containers/material storage
900-2	OU 2	BZ	Oil Burn Pit No. 2	900-153	6,403	Oil contaminated with uranium was burned in two parallel trenches
	OU 2	BZ	Pallet Burn Site	900-154	3,152	Wooden pallet burn area
900-3	OU 10	IA	904 Pad, Pondcrete Storage	900-213	127,334	Spillage & rainwater runoff of stored pondcrete/saltcrete
900-4&5	OU 10	IA	S&W Building 980 Contractor Storage Facility	900-175	5,819	Leaks and spills from drum storage
	N/A	IA	Gasoline Spill Outside Building 980	900-1308	356	Gas overflow during filling
900-11	OU 2	BZ	903 Pad	900-112	146,727	Leaks and spills from drum storage
	OU 2	BZ	Hazardous Disposal Area	900-140	65,498	Reactive metal destruction and disposal site
	OU 2	BZ	East Firing Range	SE-1602	465,173	Dispersal of lead and depleted uranium from routine weapons firing
900-12	OU 2	BZ	Trench T-5	900-111.2	19,235	Disposal of sanitary waste sludge
	OU 2	BZ	Trench T-6	900-111.3	4,089	Disposal of sanitary waste sludge
	OU 2	BZ	Trench T-8	900-111.5	7,297	Disposal of sanitary waste sludge
	OU 2	BZ	Trench T-9	900-111.6	14,705	Disposal of sanitary waste sludge, scrap metal, and junk
	OU 2	BZ	Trench T-10	900-111.7	4,271	Disposal of sanitary waste sludge
	OU 2	BZ	Trench T-11	900-111.8	5,776	Disposal of sanitary waste sludge and asphalt planking
NE/NW	OU 10	BZ	Property Utilization and Disposal (PU&D) Yard – Drum Storage	174a	4,342	Leaks and spills from RCRA drum storage
	N/A	BZ	OU 2 Treatment Facility	NE-1407	356	Leaks and spills from process operations
	N/A	BZ	Trench T-12 Located at OU 2 East Trenches	NE-1412	7,449	Disposal of sanitary waste sludge and flattened drums
	N/A	BZ	Trench T-13 Located at OU 2 East Trenches	NE-1413	5,090	Disposal of sanitary waste sludge and flattened drums
NE-1	OU 6	OU 6	Pond A-1	142.1	39,294	Received wastewater effluent from the IA spill control
	OU 5	OU 6	Pond C-2	142.11	168,524	Received discharge from the South Interceptor Ditch
	OU 6	OU 6	Pond A-2	142.2	61,373	Received wastewater effluent from the IA spill control
	OU 6	OU 6	Pond A-3	142.3	122,909	Received wastewater effluent from the IA

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IHSS Group	Old Operable Unit No.	Current Operable Unit	Description	IHSS/PAC/UBC Site	Area (ft^2)	Historical Notes
	OU 6	OU 6	Pond A-4	142.4	254,102	Received wastewater effluent from the IA
	OU 6	OU 6	Pond B-1	142.5	11,396	Flow-through retention pond, received treated sanitary effluent and process waste
	OU 6	OU 6	Pond B-2	142.6	33,761	Flow-through retention pond, received treated sanitary effluent and process waste
	OU 6	OU 6	Pond B-3	142.7	18,422	Flow-through retention pond, received treated sanitary wastewater effluent discharge
	OU 6	OU 6	Pond B-4	142.8	11,731	Flow-through retention pond, received treated sanitary effluent and process waste
	OU 6	OU 6	Pond B-5	142.9	129,515	Flow-through retention pond, received treated sanitary effluent and process waste
	OU 5	OU 5	Pond C-1	142.1	39,294	Retention and monitoring pond, received sanitary sewage discharge and runoff from the 903 Pad Area
NE-2	OU 2	BZ	Trench T-7	111.4	15,565	Disposal of sanitary waste sludge
SW-1	OU 5	OU 5	Ash Pit 1	133.1	13,960	Disposal of combustible waste ash and noncombustible trash
	OU 5	OU 5	Ash Pit 2	133.2	26,624	Disposal of combustible waste ash and noncombustible trash
	OU 5	OU 5	Ash Pit 3	133.3	13,023	Disposal of combustible waste ash and noncombustible trash
	OU 5	OU 5	Ash Pit 4	133.4	10,749	Disposal of combustible waste ash and noncombustible trash
	N/A	BZ	Recently identified ash pit (also referred to as TDEM-1)	SW-1701	11,066	Disposal of combustible waste ash, depleted uranium and metallic debris
	N/A	BZ	Recently identified ash pit (also referred to as TDEM-2)	SW-1702	5,588	Disposal of combustible waste ash, depleted uranium and metallic debris
	OU 2	BZ	Ryan's Pit (Trench 2)	109	261	Disposal of VOCs and drum carcasses
	OU 2	BZ	Trench T-3	110	7,823	Disposal of sanitary waste sludge and debris

2.1 PREVIOUS STUDIES AND REMEDIAL ACTIONS

Numerous studies conducted at RFETS include RFI/RIs, risk assessments, Interim Measure/Interim Remedial Actions (IM/IRAs), and Corrective Measure Studies/Feasibility Studies (CMS/FS). Previous studies in the IA include RFI/RI studies initiated at all previous IA OUs, Phase I and Phase II RFI/RIs, an IM/IRA at OU 4 (SEP), and a preremedial investigation at Bowman's Pond. Previous studies in the BZ include RFI/RIs at OU 1 (881 Hillside), OU 2 (903 Pad, Mound, and East Trenches), OU 5 (Woman Creek), OU 6 (Walnut Creek), OU 7 (Present Landfill), and OU 11 (West Spray Field). Remedial actions were conducted at Trenches T-1, T-2, T-3, T-4, Mound Site, and Ryan's Pit in the BZ; and PCB sites in the IA.

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THIS TARGET SHEET REPRESENTS AN OVER-SIZED MAP / PLATE FOR THIS DOCUMENT

Draft Environmental Restoration RFCA Standard Operating Protocol For Routine Soil Remediation

Figure 3
Industrial Area Groups
July 5, 2001

Map ID: 01-0698

CERCLA Administrative Record document, SW - A - 004355

U.S. DEPARTEMENT OF ENERGY
ROCKY FLATS ENVIRONMENTAL TECHNOLOGY SITE

GOLDEN, COLORADO

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THIS TARGET SHEET REPRESENTS AN OVER-SIZED MAP / PLATE FOR THIS DOCUMENT

Draft Environmental Restoration RFCA Standard Operating Protocol For Routine Soil Remediation

Figure 4
Buffer Zone IHSS & PACs
July 3, 2001

Map ID: 01-0267

CERCLA Administrative Record document, SW - A - 004355

U.S. DEPARTEMENT OF ENERGY
ROCKY FLATS ENVIRONMENTAL TECHNOLOGY SITE

GOLDEN, COLORADO

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2.2 GEOLOGY

At RFETS, relatively flat-lying Quaternary surficial deposits overlie Cretaceous bedrock. The surficial deposits consist primarily of the Rocky Flats Alluvium and artificial fill materials (EG&G 1992). The alluvium ranges from approximately 100 feet (ft) thick at the western edge of the Site to approximately 1 foot thick at the eastern edge of the Site, and consists of unconsolidated, poorly sorted coarse gravels, coarse sands, and gravelly clays with discontinuous lenses of clay, silt, and sand. The Rocky Flats Alluvium is truncated by erosion immediately east of the IA.

The alluvium unconformably overlies weathered claystone bedrock consisting of the Upper Cretaceous Arapahoe and Laramie Formations. The Arapahoe Formation ranges from 0 to approximately 50 ft thick and consists of siltstones and claystones with sandstone lenses. In some areas, such as near the SEP, well-sorted and coarse-grained sandstone is present. This sandstone provides a preferential migration pathway; however, it is interrupted by erosion and does not provide an offsite pathway for groundwater and contaminant migration. The Laramie Formation unconformably underlies the Arapahoe Formation. Beneath the Site, the Laramie Formation is 600 to 800 ft thick and consists primarily of claystone with siltstone; fine-grained sandstone and coal lenses are also present (EG&G 1995a).

2.3 SURFACE WATER HYDROLOGY

Three intermittent streams drain RFETS: Rock Creek, Walnut Creek, and Woman Creek. The northwestern corner of RFETS is drained by Rock Creek, which flows northeast through the BZ to its offsite confluence with Coal Creek. North and South Walnut Creeks and an unnamed tributary drain the northern part of the Site. The confluence of North and South Walnut Creeks is east of Ponds A-4 and B-5. The South Interceptor Ditch (SID), located between the IA and Woman Creek, collects runoff from the southern part of RFETS and ultimately diverts the water to Pond C-2. Water from the A-, B-, and C-series ponds is monitored and discharged periodically. Woman Creek is diverted over the SID, flows around Pond C-2, and then flows offsite into the Woman Creek Reservoir.

2.4 HYDROGEOLOGY

Two hydrostratigraphic units are present at RFETS: the upper hydrostratigraphic unit (UHSU), and the lower hydrostratigraphic unit (LHSU). The UHSU consists of the unconfined saturated Rocky Flats Alluvium and weathered Arapahoe and Laramie Formation bedrock. This hydrostratigraphic unit contains most of the groundwater impacted by Site activities. The LHSU consists of the unweathered Arapahoe and Laramie Formations. Claystones and silty claystones in this unit act as an aquitard, inhibiting downward groundwater movement. The geometric mean of measured hydraulic conductivity values in the Rocky Flats Alluvium is approximately 10^{-4} centimeters per second (cm/sec). LHSU conductivities are generally lower than those of the overlying UHSU because of the higher percentage of fine-grained material (EG&G 1995b).

Groundwater within the UHSU primarily flows west to east along the bedrock contact with the underlying Arapahoe and Laramie Formation claystones. Groundwater elevations are highest in

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the spring and early summer when precipitation is high and evapotransporation is low. Groundwater elevations decline during the remainder of the year, and some areas of the UHSU are seasonally dry. Groundwater from the UHSU discharges at springs and seeps on the hillsides at the contact between the alluvium and bedrock, and where sandstone lenses subcrop in drainages, and does not migrate offsite (EG&G 1995b).

To the west, where the alluvium is thickest, depth to the water table is 50 to 70 ft below ground surface (bgs). Depth to water generally decreases from west to east as the surficial material thins. Depth to water ranges from less than 2 ft to 22 ft (EG&G 1995b). Engineered structures cause variations in water levels and saturated thickness. The impact of building footing drains, utility corridors, and other structures has not been evaluated; however, these structures are believed to impact groundwater flow and are being evaluated as part of the Site-Wide Water Balance (SWWB).

The majority of remediation activities will be conducted in Rocky Flats Alluvium. However, basements of some buildings extend into the weathered Arapahoe or Laramie Formations. Because of the deep basements, UHSU groundwater may be intercepted beneath some buildings.

2.5 FUTURE LAND USE

Future Site land use assumptions are consistent with Figure 1 from RFCA Attachment 5. RFCA ALs for these land use scenarios will be applied.

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3.0 INTERFACES

Because this ER RSOP covers projects across the Site, implementation requires interaction with Site organizations performing many functions. Key interfaces are described below and illustrated on Figure 5.

3.1 DECOMMISSIONING

The decommissioning staff is responsible for dismantling Site structures and infrastructure. ER staff will work closely with decommissioning staff so remediation projects can be scheduled and resources managed effectively. Additionally, information from decommissioning activities will be used during remediation planning and implementation.

Approximately 90 percent of the potentially contaminated sites that may require soil remediation are associated with buildings or supporting infrastructure. Consequently, close interaction with decommissioning staff will be required.

ER will work with decommissioning staff to achieve an integrated process to minimize risk to workers and the environment, minimize generation of remediation wastes, streamline technical processes, and reduce project costs. Project interface points and division of responsibilities includes the following:

- The ER characterization and remediation schedule is integrated with decommissioning schedules. In general, ER characterization will start during facility deactivation or decommissioning.

- Decommissioning staff will remove any structural material to 3 ft below existing grade including facility slabs, foundations, and at least the top 3 ft of the footings/pilings.

- Decommissioning staff will remove any structures below 3 ft of the existing grade when the structure prevents access to underlying soil that requires remediation or when the structure cannot be released for unrestricted use. The removal will include the surface foundation. Any remaining footings/pilings will be assessed and may be removed during ER activities.

- Decommissioning staff will flush and remove sanitary sewer lines, tanks, and equipment associated with facilities to the isolation valve of the main system line. Clean water will be used for flushing.

- If ER staff encounters additional UBC after decommissioning staff removes contaminated structures below 3 ft of proposed final grade, ER staff will remove the additional structure as necessary to complete the remediation.

- In the event that decommissioning of a facility with a high potential for UBC occurs well before scheduled soil remedial actions, ER staff may specify that facility slabs be left in place to provide continued containment of potentially contaminated soil. This decision will be

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made on a case-by-case basis and will be documented in writing with concurrence from both groups and will be included in the project AR. The requirements for leaving the slab in place will be addressed by ER staff.

- If slab removal is delayed, the Site's landlord staff will provide surveillance and maintenance of the facility slab during the interim. The handoff from decommissioning to the landlord organization will be documented in writing between decommissioning, ER, and the landlord organizations.

- Tunnels and other underground structures will be dispositioned on a case-by-case basis. In general, the dispositioning will be conducted during decommissioning. The decision on the disposition of these structures will be identified in project management plans and RFCA decision documents.

- Foundation drains will be removed, grouted, or otherwise disrupted by ER staff to eliminate potential contaminant migration pathways. If foundation drains are disturbed during decommissioning, they will be removed.

- ER staff will assess and be responsible for determining the actions for remediating contaminated soil and associated process waste lines beneath floor slabs.

- If decommissioning occurs in an IHSS area, a silt fence or other sediment control mechanism will be used, where needed, so potential contamination does not migrate outside of the IHSS area. ER staff will address sediments that collect at the sediment control point during remediation of the associated IHSS.

- Decommissioning staff will remove all electrical and water utilities within the facility footprint. Underground utilities will be left in a stable condition outside the facility footprint, and a map will be maintained annotating the locations and sources of these utilities. The maps will be maintained in the AR and project files and provided to ER staff.

- Decommissioning staff will remove process waste lines, tanks, and any other lines associated with the process waste transfer system within or as part of the facility footprint. Decommissioning will cap off the process waste lines at the facility perimeter or closest junction, as appropriate. A map will be maintained annotating the locations and sources of the process lines and will be maintained in the AR and project files and provided to ER staff.

- Decommissioning staff will remove valve vaults. ER staff will characterize soil surrounding valve vaults and remediate as necessary.

- ER staff will work with the building engineers and planners to identify potential spills and leaks, process waste lines, and other areas of potential contamination beneath the buildings.

- The Building 374 treatment facility is not expected to accept waste after the end of fiscal year (FY)01. A replacement system will be installed and be operational in FY02.

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3.2 COMPLIANCE

The RFETS compliance organizations are responsible for guiding and supporting Site regulatory strategy and compliance. ER staff will work with compliance staff to ensure remediation is compliant with RFCA and identified Applicable or Relevant and Appropriate Requirements (ARARs). Remediation of RCRA units will be coordinated with compliance staff to ensure data generated during ER remediation activities are available for the closure of RCRA units.

3.2.1 RCRA Compliance

The compliance staff is responsible for ensuring Site activities are in accordance with RCRA requirements. Part of this responsibility includes overseeing the closure of RCRA-regulated units. Because ER staff will be responsible or partly responsible for the closure of some RCRA units, interaction and data transfer between the ER and compliance organizations is critical. Project interface points and division of responsibilities includes the following:

- ER staff will consult with the compliance staff on the location and status of RCRA-regulated units.
- ER staff will close RCRA-regulated ER units in accordance with Section 5.6 of this RSOP.
- ER staff will document the RCRA closure activities, for those units that ER closes, in the ER data management system and Closeout Report.
- ER staff will inform the compliance staff when a unit has been closed.
- The compliance staff will update the Master List of RCRA units.

3.2.2 Environmental Monitoring

The IMP (DOE, 2000a) provides a template for routine data collection for groundwater, soil, surface water, air, and ecology in the IA and BZ and around decommissioning and remediation projects. Interaction and data transfer between the compliance and ER organizations is ongoing. Project interface points and division of responsibilities includes the following:

- ER staff will consult with compliance staff on the location of surface water, groundwater plumes, and ecological resources during project planning to develop protection requirements.
- ER staff will inform compliance staff when and where remedial actions are planned. This information will be used in planning project-specific surface water, groundwater, and air monitoring activities. The compliance staff will write Sampling and Analysis Plans (SAPS) to direct project-specific monitoring in accordance with the IMP.
- ER staff will notify the compliance staff when surface water, groundwater, or ecological resources are encountered at a project site.

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3.3 WASTE MANAGEMENT

The RFETS waste management organization is responsible for Site waste management activities. ER staff will work closely with waste management staff on waste characterization and transportation issues. Of critical importance is the ability to move ER remediation waste from the remediated area. Additionally, ER staff will work with waste management staff to remove packaged wastes that are currently located in waste storage facilities within IHSS and PAC boundaries. Project interface points and division of responsibilities includes the following:

- ER staff will inform waste management staff of upcoming projects, potential waste types, and volumes prior to the start of remediation projects.

- The waste management organization will assign a Customer Service Representative (CSR) who will be responsible for providing waste management guidance and assistance to the project.

- The CSR will issue a Waste Generating Instruction (WGI) for all waste streams that identifies waste characteristics, U.S. Department of Transportation (DOT) packaging and label requirements, waste packing instructions, characterization requirements for treatment and disposal, and document requirements.

- ER staff will be responsible for waste characterization, segregation, and packaging.

- The CSR will verify that packaged waste meets WGI requirements and has been entered into the Waste and Environmental Management System (WEMS) before the waste is transferred to the waste management organization.

- Waste management staff will be responsible for storage, transportation, and disposal of ER remediation waste.

3.4 SITE SERVICES

A key Site function is the site services organization that is responsible for all Site systems. ER staff relies on the site services organization for a number of support functions. Project interface points and division of responsibilities includes the following:

- ER staff will consult with site services staff before excavation to determine whether utilities are present in the excavation area.

- The site service staff will continue to provide fire, emergency, road, and maintenance support services through closure.

- Site services staff will cap or seal and abandoned-in-place underground water distribution systems that are deeper than 3 ft below grade.

- Site services staff will close the water utility system. If the system is closed before ER remediation is complete, ER staff will be required to provide water for dust suppression, decontamination, and other uses.

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- Site services staff will remove all manholes.

- Site services staff will close the electrical power system. Power poles will be cut off at grade. After the power system is shut down, ER staff will be required to provide generators for power requirements.

- Site services staff will close the Sewage Treatment Plant (STP) and associated sanitary sewer lines. The STP and associated sewer lines will be closed in accordance with the RSOP for Facility Disposition (DOE 2000b). ER staff will characterize soil surrounding the sewer lines, remediate contaminated soil as necessary, flush contaminated pipe, and foam or grout pipelines that are deeper than 3 ft below grade.

- Storm drains will be maintained through the end of FY05 (approximately). Some components of the storm drain system may be maintained or modified as part of long-term stewardship needs after Site closure. ER staff will characterize soil around the remaining storm drains and remediate as necessary. Contaminated storm sewers will be removed. Storm sewers deeper than 3 ft below grade will be foamed or grouted and abandoned in place.

3.5 INFORMATION SOURCES

The ER staff will use a variety of information sources when making accelerated action decisions and will provide information and data developed during remediation to other Site programs. Key information sources are described below.

3.5.1 Environmental Restoration Data Management

The ER staff will manage all ER-specific data through an integrated data management system (Section 11). Data generated during ER activities will be available to other Site programs. Additionally, ER may use data from these other programs in accelerated action decisions.

3.5.2 Actinide Migration Evaluation

The Actinide Migration Evaluation (AME) staff evaluates the behavior and mobility of actinides in surface water, groundwater, and soil environments. Results of AME studies may be used when planning remediation activities. AME studies and their relevance to remediation planning include the following:

- Report on Soil Erosion and Surface Water Sediment Transport Modeling for the Actinide Migration Evaluations at the Rocky Flats Environmental Technology Site (DOE 2000c). Results of this study include average erosion rates for Site watersheds, erosion mechanisms, actinide source areas that have the potential to impact surface water quality, and model simulations for Pu-239/240 and Am-241 concentrations in Site streams. The results of this study may be used to evaluate potential impacts to surface water from soil erosion at IHSSs, PACs, and UBC sites that have surface soil radionuclide activities between RFCA Tier I and Tier II ALs. Additionally, erosion-modeling results may be used in implementing erosion controls at remediation sites.

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- Final Report on Phase Speciation of Pu and Am for Actinide Migration Studies (DOE 2000d). Results of this study indicate that Pu and Am solubility is limited in natural water. Both Pu and Am can be transported by sorption onto and migration with colloidal particles. Particulate transport is the dominant mechanism for Pu migration at RFETS. The results of this study may be used to evaluate potential impacts to surface water at IHSSs, PACs, and UBC sites.

- Air Transport and Deposition of Actinides at the Rocky Flats Environmental Technology Site (DOE 1999b). This study focused on emission of actinides into the air from contaminated soil or debris (resuspension), transport of airborne actinides (dispersion), and removal of actinide-contaminated particles from the air to soil or water (deposition). The results of this study will be used when planning dust and other air-borne contaminant controls at remediation sites.

- Geochemical Modeling of Solar Ponds Plume Groundwater at the Rocky Flats Environmental Technology Site. Results from this ongoing study indicate that the SEP U plume is attenuated, perhaps due to sorption and reaction with aquifer material. The results of this study may be used to evaluate potential impacts to surface water at IHSSs, PACs, and UBC sites.

- FY01 studies are focusing on the relationship between actinides and colloid stability in the environment. Results of these studies may be used, when available, to plan and implement erosion controls at remediation sites.

3.5.3 Site-Wide Water Balance

The purpose of the SWWB is to develop information to support a hydrologic design basis for RFETS closure activities. ER remediation, sitewide closure activities, and the final end-state configuration have the potential to significantly alter groundwater, surface water, and near-surface flow at the Site. The SWWB will provide information for the final land configuration that will protect surface water resources and for the CRA. Modeling results may also be used when evaluating potential impacts to surface water at IHSSs, PACs, and UBC sites.

3.5.4 Land Configuration Design Basis

The goal of the Land Configuration Design Basis (LCDB) project is to develop the data necessary to design the final land surface configuration for RFETS. ER data will be used in the design models. The model results may be used, when available, in the accelerated action decision process to evaluate potential impacts to surface water at IHSSs, PACs, and UBC sites.

4.0 LONG-TERM REMEDIAL ACTION OBJECTIVES

Remedial action objectives (RAOs) are contaminant- and medium-specific goals designed to protect human health and the environment and are used to guide the remedial actions. The overall long-term RAOs for RFETS soil are as follows:

1. Provide a remedy that is consistent with the RFETS goal for protection of human health and the environment.

2. Provide a remedy that minimizes the need for long-term maintenance.

3. Minimize the spread of contaminants during implementation of remedial actions.

4.1 SURFACE SOIL

Most surface soil at IHSSs and PACs that may require remediation is not characterized. The anticipated contaminant types are expected to be the same as those in previously characterized areas based on process knowledge and waste stream characterization. RAOs are developed to address categories of anticipated COCs - radionuclides, organics, and metals. The overall RAO for surface soil is to prevent human exposure to contaminated surface soil exceeding RFCA Tier I ALs. Additionally, the RAOs are intended to protect surface water quality and ecological resources. Based on COCs and potential exposure pathways for surface soil, the RAOs include the following:

1. Prevent human exposure (e.g., direct contact, ingestion, and inhalation) to contaminated surface soil that would result in a cancer risk greater than 10^{-4} (RFCA Tier I ALs).

2. Prevent human exposure (e.g., direct contact, ingestion, or inhalation) to contaminated surface soil having a hazard index (HI) greater than or equal to one for noncarcinogens.

3. Prevent human exposure (e.g., direct contact, ingestion, inhalation, and external irradiation) to contaminated surface soil that would result in an annual radiation dose exceeding RFCA ALs.

4. Protect surface water quality.

5. Protect ecological resources during remediation while not adversely impacting other ecological resources.

The final action for the Site, which will be described in the final CAD/ROD, will provide for long-term protection of human health and the environment, address remaining threats posed by the Site, and protect surface water resources.

Remediation objectives will be ensured by demonstrating that the 95% upper confidence limit (UCL) of the mean concentrations of residual COCs across an area of concern (AOC) (as defined in the IASAP [DOE 2001a] and Draft BZSAP [DOE 2001b]) is below the RFCA Tier 1 AL.

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4.2 SUBSURFACE SOIL

Most subsurface soil in IHSSs, PACs, and UBC sites that may require remediation is not yet characterized. The anticipated contaminant types are expected to be the same as those in characterized areas based on process knowledge and waste stream characterization. RAOs are developed to address categories of anticipated COCs - radionuclides, organics, and metals. Subsurface soil will be remediated to agreed upon cleanup levels. The RAOs for subsurface soil are to remediate subsurface soil to the extent necessary to protect surface water resources (from groundwater transport of contaminants) and to protect ecological resources. Based on the overall goal, COCs, and potential exposure pathways, subsurface soil RAOs are:

1. Prevent adverse effects to surface water quality resulting from the subsurface soil to groundwater to surface water contaminant migration pathway.

2. Remediate soil containing COCs above agreed upon cleanup levels from 6 inches bgs to the top of the saturated zone or the top of bedrock, as appropriate, to address the extent of contamination.

3. Provide a remedy that minimizes the need for long-term maintenance.

4. Protect ecological resources during remediation while not adversely impacting other ecological resources.

The final action for the Site, which will be described in the final CAD/ROD, will provide for long-term protection of human health and the environment, address remaining threats posed by the Site, and protect surface water resources.

4.3 APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS

RFETS accelerated actions must attain, to the maximum extent practicable, federal and state ARARs listed in Table 2.

4.4 DECISION FRAMEWORK

The ER RSOP accelerated action decision framework is shown on Figure 6 and includes the following components:

- Concurrence with RAOs;

- Comparison to Data Quality Objectives (DQO) decision rules; and

- Confirmation sampling.

The ER RSOP decisions are based on the Preliminary Data Quality Objectives for the Industrial Area Sampling and Analysis Plan (DOE 2000e). DQOs for accelerated action decisions contain data aggregation and AL comparison rules as illustrated on Figure 7. Data aggregation and AL comparison methods are detailed in the IASAP (DOE 2001a) and the Draft BZSAP (DOE 2001b).

Table 2
Applicable or Relevant and Appropriate Requirements

Requirement	Citation	Compliance Strategy	Excavate	Stabilize or Treat
Colorado Air Quality Control Commission (CAQCC) Regulations	5 Code of Colorado Regulations (CCR) 1001		X	X
• Emission Control Regulations for Particulates, Smoke, Carbon Monoxide, and Sulfur Oxides	5 CCR 1001-3			
- Opacity	Section II.A.1	The Site will not allow the emission into the atmosphere of any air pollutant that is in excess of 20percent opacity from covered sources. Certified visible emissions evaluators will be available to ensure compliance.		
- Fugitive Particulate Emissions - Construction Activities - Storage and Handling of Materials - Haul Roads - Haul Trucks	Section III.D Section III.D.2(b) Section III.D.2(c) Section III.D.2(e) Section III.D.2(f)	Use a combination of dust control measures (Section 6) that may include covering loads, speed reduction, water sprays, road cleaning, covering or stabilization of spoil piles, and ceasing work at certain wind speeds.		
• Air Pollutant Emission Notice (APEN)	5 CCR 1001-5, Part A	APENS will be submitted as appropriate in accordance with RFCA. Fuel consumption limits for fuel-fired equipment will be followed.	X	X
• Construction Permits	5 CCR 1001-5, Part B	Construction permits are not required, but requirements such as fuel consumption limits for fuel-fired equipment will be followed.	X	X
• Emissions of VOCs - Transfers of VOCs	5 CCR 1001-9 Regulation Number 3	Use submerged fill or bottom filling equipment when transferring VOCs to any tank, container, or vehicle compartment with a capacity exceeding 56 gallons.	X	X
• Disposal of VOCs - Construction Permit Requirements	5 CCR 1001-9 Regulation Number 3 Section V	VOCs will not be disposed by evaporation or spillage unless reasonably achievable	X	X

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Requirement	Citation	Compliance Strategy	Excavate	Stabilize or Treat
		control technologies (RACTs) are utilized.		
National Emission Standards for Hazardous Air Pollutants (NESHAPS) • National Emission Standards for Emissions of Radionuclides Other Than Radon From Department of Energy Facilities	40 Code of Federal Regulations (CFR) 61, subpart H		X	X
- Standard	61.92	The Site Radioactive Ambient Air Monitoring Program (RAAMP) sampling network is used to verify compliance with the 10 millirem (mrem) per year standard.		
- Emission Monitoring and Test Procedures	61.93	Radionuclide emissions measurements will be made at all release points that have a potential to discharge radionuclides into the air that could cause an effective dose equivalent (EDE) to the most impacted member of the public in excess of 1 percent of the standard (0.1 mrem/year).		
- Compliance and Reporting	61.96	Site personnel perform radionuclide air emission assessments on all new and modified sources. Appropriate notifications are submitted for sources with calculated controlled emissions that exceed 0.1 mrem/year EDE.		
Federal Water Pollution Control Act (FWPCA), Clean Water Act (CWA) Colorado Basic Standards and Methodologies for Surface Water	5 CCR 1002-31	Surface water quality will be monitored in accordance with RFCA Attachment 5 requirements.	X	X
National Pollutant Discharge Elimination System (NPDES) Regulations • Best Management Practices (BMP) Program	40 CFR 125 .104	Compliance with current Site Storm Water Management Plan will constitute field compliance with FWPCA.	X	X
Endangered Species Act (ESA)	50 CFR 402	Identify and minimize early in the planning stage of an action, any potential conflicts between the action and federally listed species.	X	

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Requirement	Citation	Compliance Strategy	Excavate	Stabilize or Treat
Migratory Bird Treaty	50 CFR 10	Prevent or minimize contact with listed birds and nests. Consult with the responsible RFETS ecologist.	X	
Solid Waste Disposal Act (RCRA) Solid Waste Disposal Sites and Facilities • Definitions	6 CCR 1007-2 Section 1.2	Soil generated during remediation will be characterized. Contaminated soil will then be placed in containers for offsite disposition. If contaminated soil is not immediately shipped to a waste disposal facility, waste will be managed onsite in accordance with substantive requirements.	X	
Identification and Listing of Hazardous Waste	6 CCR 1007-3, Part 261	All remediation waste will be characterized to determine a hazardous waste classification.	X	
Generator Standards • Hazardous Waste Determinations • Hazardous Waste Accumulation Areas	6 CCR 1007-3 Part 262 262.11 262.34(a)(i)(i)(ii) (iv, excluding A&B) (a)(3); (a) (4); (c)(1)	Waste characteristics will be determined. Waste will be staged onsite in appropriate storage facilities	X	
Contingency Plan and Emergency Procedures • Purpose and Implementation • Emergency Coordinator • Emergency Procedures	6CCR 1007-3 Part 264, Subpart D .51 (b) .55 .56 (a-I)	Emergencies such as fire, explosion, or release of hazardous waste will be mitigated immediately. A designated employee will be responsible for coordinating emergency response actions.	X	X
Manifest System, Record Keeping, and Reporting • Operating Record • Record Keeping	6 CCR 1007-3, Part 264, Subpart E 264.73 264.74	Use of WEMS and compliance with RFETS disposal procedures will constitute compliance.	X	X
Use and Management of Containers • Condition of Containers • Compatibility of Waste in Containers • Management of Containers • Inspections	6 CCR 1007-3 Part 264, Subpart I .171 .172 .173 .174	Containers will be maintained in good condition and kept closed except when adding or removing waste. Wastes will be compatible with containers.	X	X
Miscellaneous Units	6 CCR 1007-3 Part 264,	The thermal desorption unit		X

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Requirement	Citation	Compliance Strategy	Excavate	Stabilize or Treat
• Environmental Performance Standards • Monitoring, Analysis, Inspection, Response, Reporting, and Corrective Action • Post Closure Care	Subpart X [40 CFR Part 264, Subpart X] .601 .602 .603	will be designed, constructed, operated, and maintained in a manner that protects groundwater, surface water, wetlands, soil, and air.		
Air Emission Standards for Process Vents • Standards: Process Vents • Standards: Closed-Vent Systems and Control Devices • Test Methods and Procedures	6 CCR 1007-3 Part 264, Subpart AA .1032 .1033 .1034	Air emission standards will be incorporated into the design of process vents associated with thermal desorption operations to achieve compliance with requirements for hazardous wastes with organic concentrations equal to or greater than 10 parts per million (ppm) (by weight).		X
Corrective Action for Solid Waste Management Units • Temporary Units	6 CCR 1007-3, Part 264.553 (a-c) [40 CFR Part 264, Subpart S]	Hazardous or mixed waste may be stored in a temporary unit. This status is appropriate because of the short duration of operation of the unit, limited potential for release from the unit, and type of unit being established.	X	X
Thermal Treatment	6 CCR 1007-3 Part 265, Subpart P	Operating parameters will be incorporated in system design as appropriate for thermal desorption technology.		X
Land Disposal Restrictions (LDR) • Dilution Prohibited as a Substitute for Treatment • LDR Determination (Determination if Hazardous Waste Meets the LDR Treatment Standards) • Special Rules for Wastes that Exhibit a Characteristic • Universal Treatment Standards for VOCs	6 CCR 1007-3 Part 268 [40 CFR Part 268] .3 .7 .9 (a-c) .48	Hazardous remediation waste treated in the thermal desorption unit will meet the substantive requirements outlined in the regulation.	X	X
Toxic Substances Control Act (TSCA)	40 CFR 761	All PCB waste stored or disposed will be controlled so	X	

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Requirement	Citation	Compliance Strategy	Excavate	Stabilize or Treat
Disposal Requirements • Applicability • Disposal Requirements • PCB Remediation Waste • PCB Bulk Product Waste • Disposal of R&D and Chemical Analyses Wastes	 761.50 761.60 761.61 761.62 761.64	as to meet applicable requirements.		
Chronic Beryllium Disease Prevention Final Rule • Definitions • Waste Disposal • Warning Labels • Release Criteria	10 CFR 850 .3 .32 .38(b-c)	Debris suspected of being contaminated with beryllium >0.2 μg/100 cm^2 will be controlled and disposed so as to meet applicable requirements.	X	
Radiation Control	6 CCR 1007-1			
Emergency Plan – required if material quantity exceeds Schedule E of Part 3 (e.g., 2 curies of alpha emitters) and evaluation shows maximum dose to offsite person from release exceeds 1 rem (5 rem to thyroid).	RH 3.9.11	DOE maintains its Emergency Plan in accordance with DOE Order 151.1, "Comprehensive Emergency Management System"	X	X
Decommissioning Plan Contents – must include a description of methods used to ensure protection of workers and the environment against radiation hazards during decommissioning.	RH 3.16.4.3.3	Procedures to meet 10 CFR 835, "Occupational Radiation Protection" and the Site's IWCP process will be described for proposed actions.	X	X
Decommissioning Plan Contents – must include a description of the planned final radiation survey.	RH 3.16.4.3.4	Planned implementation of the Decommissioning Characterization Protocols or any final sampling and analysis plan for environmental media will be described.	X	X
Decommissioning Plan Contents – must include a description of the intended final condition of the site, buildings and/or outdoor areas upon decommissioning.	RH 3.16.4.3.6	The intended condition upon completion of an accelerated action will be described in the notification letter.	X	X
Decommissioning Plan Contents – if proposing to use the criteria in RH 4.61.3 or RH 4.61.4 (restricted access), the plan must include analysis demonstrating that reductions in residual radioactivity necessary to comply with the provisions of RH 4.61.2 (unrestricted access) would result in net public or environmental	RH 3.16.4.3.7.1	The analysis will be part of any accelerated action or final action regulatory decision document for environmental media cleanup projects proposing restricted access.	X	X

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Requirement	Citation	Compliance Strategy	Excavate	Stabilize or Treat
harm or were not being made because residual levels of contamination associated with restricted conditions are ALARA, taking into account consideration of any detriments expected to potentially result from decontamination and waste disposal.				
Decommissioning Plan Contents – if proposing to use the criteria in RH 4.61.3 or RH 4.61.4 (restricted access), the plan must include an analysis demonstrating that if institutional controls were no longer in effect, the dose criteria of RH 4.61.3.3 (described below) will be met.	RH 3.16.4.3.7.3		X	X
Decommissioning Plan will be approved by CDPHE if information therein meets RH 3.16, and RH 4.61, decommissioning is completed as soon as practicable, and health and safety of the public is adequately protected.	RH 3.16.4.6	This section also specifies requirements for a long term care warranty under RH 3.9.5.10 that may be required if using the criteria in RH 4.61.3 or RH 4.61.4 (restricted access). The RFCA Parties agree that further analysis is required to determine whether long term care warranty requirements are relevant and appropriate to Rocky Flats. Planned implementation of Site approved procedures to meet DOE Order 5400.5, *Radiation Protection of the Public and the Environment* and the Site's IWCP process, which includes Lead Regulatory Agency involvement, will be described for proposed actions. The Closure Project Baseline is focused on achieving decommissioning as soon as practicable.	X	X
Site radiation survey to establish residual contamination levels and/or confirm absence of contamination. As appropriate, survey building/outdoor areas that contain residual radioactivity.	RH 3.16.6.2	Requirements for radiation surveys are met through the Reconnaissance Level Characterization Survey Plans and Predemolition Survey Plans for facility decommissioning and	X	X

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Requirement	Citation	Compliance Strategy	Excavate	Stabilize or Treat
		through Sampling and Analysis Plans and the Integrated Monitoring Plan for Environmental Restoration.		
Submittal of final survey report, units and other information – specifies, as appropriate, that gamma levels be reported at 1 meter from surface in microrem/hr, removable and fixed contamination in DPM/100 cm^2, and radioactive concentrations in pCi/L or per gram; identify instruments used and certify proper calibration/testing.	RH 3.16.6.3	Same as RH 3.16.6.2 above	X	X
Radiation Protection Program – To extent practicable, procedures and controls used shall be based on sound radiation protection principles to achieve public doses that are ALARA.	RH 4.5.2	Planned implementation of Site approved procedures to meet 10 CFR 835, *Occupational Radiation Protection*, DOE Order 5400.5, *Radiation Protection of the Public and the Environment* and the Site's IWCP process, which includes Lead Regulatory Agency involvement, will be described for proposed actions.	X	X
Radiation Protection Program – Imposes constraint on air emissions of radioactive material to the environment. "Individual member of the public likely to receive the highest dose" will not be expected to receive a TEDE greater than 10 mrem/yr from air emissions. Requires exceedance reporting and corrective action to ensure against recurrence.	RH 4.5.4	Listed only for completeness of this table. NESHAPS already identified as ARAR. Radionuclide NESHAPS required monitoring established at site perimeter is used to determine potential for exposure to individual member of the public.	X	X
Dose limits for individual members of the public – TEDE from licensed operations less than 100 mrem/yr above background, exclusive of medical exposure and exposure from disposal by sanitary sewer. Dose rate in unrestricted areas less than 2 mrem/hr.	RH 4.14.1	Site approved procedures to meet DOE Order 5400.5, *Radiation Protection of the Public and the Environment* are based on the same dose rate limits.	X	X
Dose Limits for Individual Members of Public – Surveys of radiation levels in unrestricted areas and radioactive materials in effluents released to unrestricted areas shall be made to	RH 4.15.1	Surveys are conducted pursuant to site approved procedures to meet DOE Order 5400.5, *Radiation Protection of the Public and*	X	X

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Requirement	Citation	Compliance Strategy	Excavate	Stabilize or Treat
demonstrate compliance with the dose limits for individual members of the public in RH 4.14.		*the Environment.* Radionuclide NESHAPS required monitoring established at site perimeter is used to determine potential for exposure to individual member of the public. Surface water is monitored in accordance with the Integrated Monitoring Plan and RFCA Attachment 5.		
Dose Limits for Individual Members of Public – Provides the means to demonstrate compliance with RH 4.14: by measurement or calculation that dose does not exceed the annual limit or by demonstrating that annual average radioactive material concentration released in gaseous and liquid effluents at boundary of the unrestricted area does not exceed Appendix B, Table II, "Effluent Concentrations".	RH 4.15.2.1 and .2	Site approved procedures to meet DOE Order 5400.5, *Radiation Protection of the Public and the Environment* are based on the same dose rate limits. Radionuclide NESHAPS required monitoring established at site perimeter is used to determine potential for exposure to individual member of the public. Surface water is monitored in accordance with the Integrated Monitoring Plan and RFCA Attachment 5.	X	X
Surveys shall be made as necessary to evaluate radiation levels, concentrations of radioactive material and potential radiological hazards that could be present.	RH 4.17.1	Planned implementation of Site approved procedures to meet 10 CFR 835, *Occupational Radiation Protection*, DOE Order 5400.5, *Radiation Protection of the Public and the Environment* and the Site's IWCP process, which includes Lead Regulatory Agency involvement, will be described for proposed actions. Requirements for radiation surveys are met through the Reconnaissance Level Characterization Survey Plans and Predemolition Survey Plans for facility decommissioning and through Sampling and Analysis Plans and the Integrated Monitoring Plan for Environmental Restoration.	X	X

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Requirement	Citation	Compliance Strategy	Excavate	Stabilize or Treat
Instruments and equipment used for qualitative radiation measurements must be calibrated at intervals NTE 12 months, unless otherwise noted by regulation.	RH 4.17.2		X	X
Waste Disposal – Shall dispose only by transfer to authorized recipient, by release in effluents within the limits of subpart RH 4.14 (discussed above), or as authorized pursuant to (pertinent to RFETS) RH 4.34, "Method for Obtaining Approval of Proposed Disposal Procedures", or RH 4.35, "Disposal by Release into Sanitary Sewerage".	RH 4.33	Transfer to authorized recipient is met through compliance with the "offsite rule", 40 CFR 300.440. Proposals for onsite disposal of radioactive waste (if any) will be part of any accelerated action, or any final action regulatory decision document for environmental media cleanup projects proposing specific disposal methods. RH Part 11, "Special Land Ownership Requirements" which addresses requirements if government ownership of RFETS is transferred to private ownership, and RH Part 14, "Licensing Requirements for Land Disposal of Low Level Radioactive Waste" will be reviewed for relevant and appropriate requirements for cleanup projects proposing specific disposal methods.	X	X
Radiological Criteria (for Decommissioning) – Determination of dose and residual activity levels which are ALARA, must take into account consideration of any detriments expected to potentially result from decontamination and waste disposal.	RH 4.61.1.3	The analysis will be part of any accelerated action for environmental media cleanup projects and will be provided in the notification letter unless it is included in the RSOP itself and any final action regulatory decision document. See the Radionuclide Soil Action Level (RSAL) Regulatory Analysis for the RFCA Parties understandings regarding implementation of the "Decommissioning Rule."	X	X

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Requirement	Citation	Compliance Strategy	Excavate	Stabilize or Treat
Criteria for Unrestricted Use – Residual radioactivity above background has been reduced to levels that are ALARA and results in TEDE to average member of the critical group that does not exceed 25 mrem/yr., including groundwater sources of drinking water.	RH 4.61.2	The analysis will be part of any accelerated action for environmental media cleanup projects and any final action regulatory decision document. See the RSAL Regulatory Analysis for the RFCA Parties understandings regarding implementation of the "Decommissioning Rule."	X	X
Criteria for Restricted Use – Must demonstrate that further residual radioactivity reductions to meet Unrestricted Use: 1) would result in net public or environmental harm OR 2) are not being made because residual levels are ALARA.	RH 4.61.3.1	See the RSAL Regulatory Analysis for the RFCA Parties understandings regarding implementation of the "Decommissioning Rule."	X	X
Criteria for Restricted Use – 1) Provisions made for durable, legally enforceable institutional controls that provide reasonable assurance that TEDE to average member of the critical group will not exceed 25 mrem/yr. AND 2) If Institutional Controls were no longer in effect, TEDE above background is ALARA and would not exceed either: 100 mrem/yr. OR 500 mrem/yr., if demonstrated that further reductions are not technically achievable, would be prohibitively expensive or would result in net public or environmental harm.	RH 4.61.3.2 and .3	See the RSAL Regulatory Analysis for the RFCA Parties understandings regarding implementation of the "Decommissioning Rule."	X	X
Alternate (Decommissioning) Criteria 1) Analysis provides assurance that public health and safety would continue to be protected and unlikely TEDE would be more than 100 mrem/yr. 2) Employment of restrictions on site use that minimize exposures at the site. Doses are reduced to ALARA.	RH 4.61.4.1.1 through .3	See the RSAL Regulatory Analysis for the RFCA Parties understandings regarding implementation of the "Decommissioning Rule."	X	X

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5.0 PROJECT APPROACH

The approach to surface and subsurface soil and associated debris remediation at RFETS includes several key components that will be used routinely for each IHSS, PAC, or UBC site remediation. These components include the following:

- RFCA consultative process;
- Work planning;
- Remediation; and
- Documentation.

5.1 WORK PROCESS

Figure 8 illustrates the routine remediation work processes and includes (1) characterization process and how it fits in with the remediation process, (2) work planning, (3) data analysis, (4) soil and associated debris remediation, and (5) Closeout Report.

IHSSs, PACs, and UBC sites will be sampled and evaluated in accordance with the IASAP (DOE 2001a) and Draft BZSAP (DOE 2001b) to determine whether remediation is required. After characterization is complete, the analytical data will be evaluated and an accelerated action decision will be made. If remediation is required, a map of the remediation target is prepared and sent to the LRA.

5.2 WORK PLANNING

ER remediation projects will be planned and conducted in accordance with the five core principles of the Integrated Safety Management System (ISMS):

- Define the work scope;
- Identify and analyze the hazards;
- Identify and implement controls;
- Perform the work; and
- Provide feedback.

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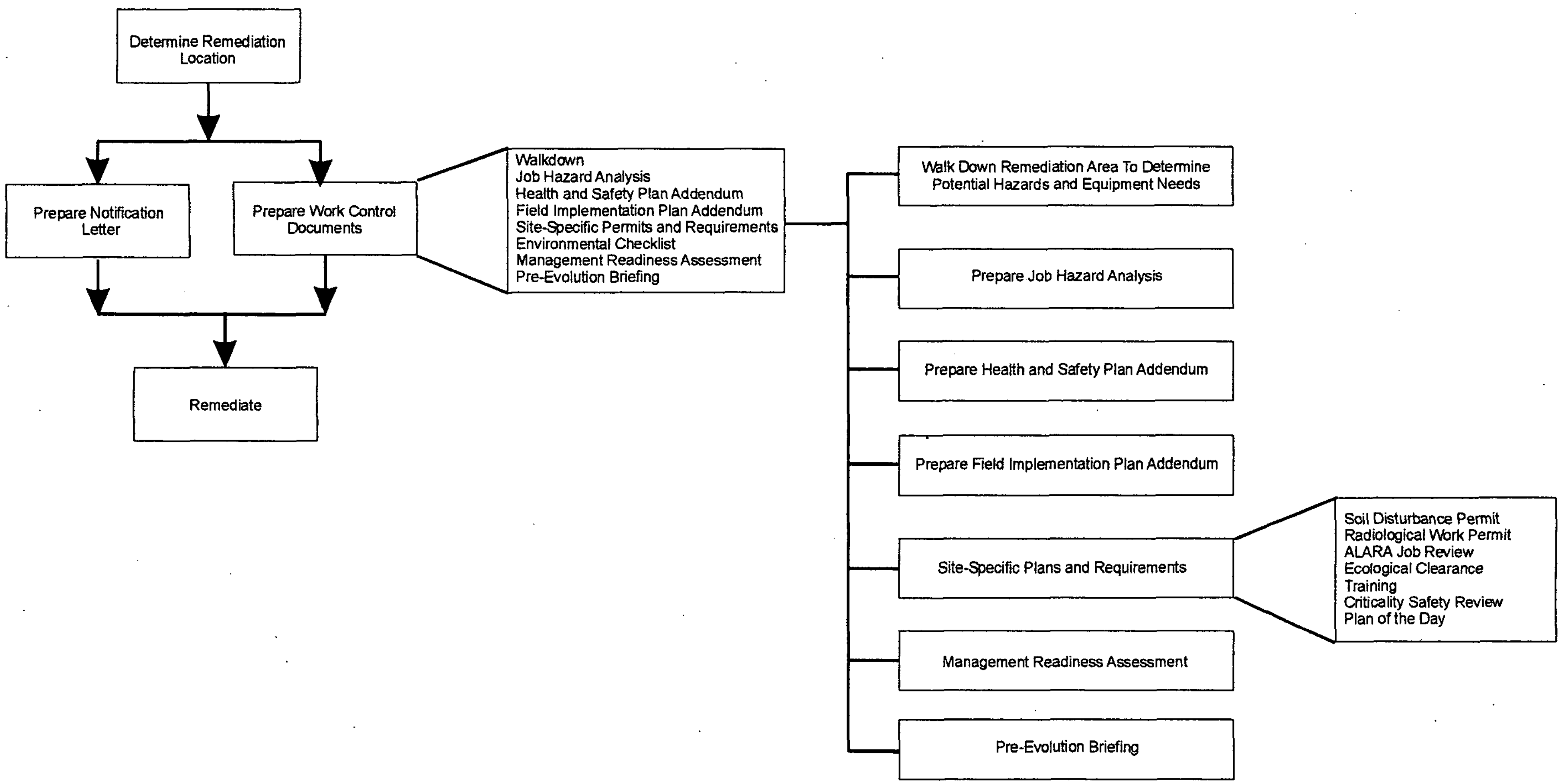
Figure 8
Draft ER RSOP Work Planning Process

RFETS/Agency Consultation

RFETS



At RFETS, ISMS is implemented through the Integrated Work Control Program (IWCP), which provides the framework for mitigating adverse impacts to workers, the public, and the environment. ISMS is implemented through Site-specific work control documents, as shown on Figure 8. Because work conducted in accordance with the ER RSOP is routine, preparation of work controlling documents and processes have been streamlined. Streamlined documents and process include the IASAP (DOE 2001a), Draft BZSAP (DOE 2001b), ER RSOP, Health and Safety Plan (HASP), Field Implementation Plan (FIP), Auditable Safety Analysis, Soil Disturbance Permit, Environmental Checklist, Criticality Safety Review, and Waste Instructions. These documents and processes were developed to provide requirements, methods, work controls, and instructions for all projects covered under this ER RSOP. Addenda will be developed for individual projects, as necessary.

Site-specific work control documents and requirements include the following:

- IA and BZ SAPs;
- ER RSOP for Routine Soil Remediation;
- Job site walkdown to determine potential hazards, and equipment needs;
- Job Hazards Analysis (JHA) which includes specific work hazards and appropriate hazard controls;
- HASP Addendum which includes project-specific additions to the remediation HASP;
- FIP Addendum which includes project-specific additions to the remediation FIP;
- RFETS-specific permits and requirements (as required) including:

– Auditable Safety Analysis,

– Soil Disturbance Permit to document potential contamination in areas where soil will be disturbed,

– Radiological Work Permit (RWP) to document radiological controls (exposure limits) if necessary,

– As Low As Reasonably Achievable (ALARA) Job Review to determine operation controls to limit worker exposure;

– Ecological Clearance to determine whether ecological resources may be impacted and if impacts can be mitigated,

– Criticality Safety Review to determine whether additional engineered or administrative safety controls are required,

– Waste Instructions that include anticipated waste streams, packaging instructions, and sampling and analysis requirements,

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  - Training Matrix, which includes project personnel, required training, and documentation of training, and
  - Plan of the Week/Day to schedule, authorize, and control remediation activities and to discuss planned activities and scheduling;
- Environmental Checklist to determine impacts to the environment and the impact of regulatory requirements;
- Management Readiness Assessment to document that all requirements for the project have been met; and
- Pre-Evolution Briefing conducted prior to the start of the remediation fieldwork to ensure project personnel understand the project, hazards and controls, H&S requirements, and other Site requirements for the project.

When all requirements have been completed remediation work will begin.

RFETS specific requirements also include implementation of DOE O 5400.5, *Radiation Protection of the Public and the Environment*, ALARA objectives. The definition of ALARA in DOE Order 5400.5 is,

> "ALARA is a phrase (acronym) used to describe an approach to radiation protection to control or manage exposures (both individual and collective to the work force and the general public) and releases of radioactive material to the environment as low as social, technical, economic, practical and public policy considerations permit. As used in this Order, ALARA is not a dose limit, but rather it is a process that has as its objective the attainment of dose levels as far below the applicable limits of the Order as practicable."

These objectives are consistent with the ALARA objectives specified in the Radiation Control ARARs, Table 2, Section 4.3 of this RSOP. DOE believes that the work planning and work control processes already identified in this RSOP pursuant to RFCA requirements are fully consistent with well-accepted ALARA processes. However, the RFCA parties are consulting regarding the process by which the common ALARA objectives are evaluated in relation to the cleanup actions covered by this RSOP. This consultation will include consideration of public comments regarding the ALARA approach.

5.3 ACCELERATED ACTION DECISIONS

Accelerated action decisions will be made based on RAOs and the evaluation of characterization and existing analytical data in accordance with Draft BZSAP (DOE 2001b) and IASAP (DOE 2001a) DQOs. Figure 9 illustrates the remedial action decision process. Action will be taken based on these DQOs in accordance with the following:

- When the 95% UCL of the mean COC concentration across an AOC is above RFCA Tier I ALs for surface soil or agreed upon cleanup levels for subsurface soil, or the sum of the ratios of the 95% UCLs of the mean concentration for COCs across an AOC to their

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respective RFCA Tier I ALs is greater than 1 for surface soil, or agreed upon cleanup levels for subsurface soil.

- When analytical results indicate contaminant concentrations between Tier I, or agreed upon cleanup levels, and Tier II, the AOC will be evaluated to determine whether additional remediation or management is warranted to protect surface water resources. Additional Site studies, including the AME, SWWB, LCDB, and IMP, may provide information for this evaluation.

- When analytical results indicate a hot spot is present at 3 times the RFCA Tier I AL for surface soil or agreed upon cleanup levels for subsurface soil, in accordance with the elevated measurement comparison in the IASAP (DOE 2001a) and BZSAP (DOE 2001b). A detailed description of the data aggregation, analysis, and hot spot determination is presented in the IASAP (DOE 2001a) and Draft BZSAP (DOE 2001b).

5.3.1 Surface Water Protection

Remediation to agreed upon cleanup levels at some IHSSs, PACs, and UBC Sites may not be sufficient to protect surface water standards. It is anticipated there will be very few instances when this will be necessary because of the following:

- Subsurface soil ALs were developed to be protective of surface water quality standards and radionuclide subsurface soil ALs are equal to surface soil ALs.

- There are very few IHSSs where there is a pathway from surface soil to surface water, AME data indicates that particulate transport is the dominant migration pathway from surface soil to surface water, and additionally states "Actinide source areas that have the potential to impact surface water quality due to erosion and sediment transport are the following:

  - The 903 Pad and Lip Area (903 Pad Area)
  - An area south and southwest of the old firing range and access road to the north of the SID;
  - The Woman Creek watershed between Pond C-1 and the Mower Diversion; and
  - The areas near the A- and B-series Ponds, South Walnut Creek, and the north-facing hillslopes adjacent to South Walnut and Walnut Creeks." (DOE 2000c)

  As shown on Figures 2 and 3, the majority of IHSSs, PACs, and UBC Sites covered under this RSOP are not located in these areas. Remediation of the 903 Pad and Lip Area is covered under a separate IM/IRA.

- Areas where surface soil is remediated to agreed upon cleanup levels will be backfilled according to Section 5.12.2, stabilized and revegetated. This will prevent erosion of remaining soil into surface water; and

- The final land configuration will provide additional cover where required.

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Where a pathway to surface water exists the following evaluation will take place:

- Characterization data will be evaluated to determine concentration of contaminants in soil.
- Compliance monitoring results from points of evaluation (POE) will be evaluated to determine whether there are current surface water impacts from contaminated surface soil.
- AME data and information will be reviewed to determine whether there is a potential for erosion and surface water impacts.
- If these data indicate remediation to agreed upon cleanup levels is not protective of surface water resources, additional remediation or management may be required.
- If additional remediation or management is required the consultative process will be used to determine the following:
    - Remediation targets (area and COCs), if necessary;
    - Management actions, if necessary, which may include stabilization, monitoring, or best management practices (BMPs).

5.4 REMEDIATION MAPS

Remediation maps will be developed using statistical and geostatistical analysis of characterization data. It is anticipated that geostatistical analysis will be used when sufficient data are available and there is a spatial correlation of the data. At hot spots, geostatistical analysis may not be appropriate, and a standard spatial contouring approach will be used.

5.4.1 Geostatistical Remediation Maps

As part of data analysis, a geostatistical approach may be used to generate potential remediation targets. Initially, maps showing the probability of exceeding the cleanup goals at IHSSs, PACs, and UBC sites are generated. From these "probability of exceedance" maps, remediation target maps can be developed for cleanup goals at a number of levels of remediation reliability. The geostatistical approach is iterative and based on remediating to below required cleanup goals. Previous applications indicate this approach provides a high level of confidence that confirmation sampling will confirm that remediation is complete.

The process for determining remediation locations is described below.

1. Characterization data will be used to develop maps and histograms of the known distribution of contamination.
2. A variogram, which describes the geostatistical spatial correlation between the samples, will be generated.

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3. The histogram, sample values, location, and variogram are used for the geostatistical simulations. The simulations indicate the likely concentration and level of uncertainty about that concentration in nonsampled areas. The simulations are processed to produce maps defining the spatial distribution of the contaminants and the inherent uncertainty in that spatial distribution.

4. Probability maps that describe the likelihood that the contaminant value at any nonsampled location exceeds the AL are generated.

5. An excavation map is developed from the probability map. The excavation map requires that an acceptable reliability of remediation be determined.

The geostatistical approach is designed for contamination that exhibits spatial correlation, not for developing a remediation plan around a single "hot spot." Based on characterization sampling, a decision will be made as to whether the samples define a distributed contaminant (apply geostatistical approach) or a localized hot spot (as defined in Chapter 10 of Gilbert [1987]).

5.4.2 Hot Spot Remediation Maps

In areas where hot spots are identified, remediation maps may use a variety of isopleth algorithms (including kriging, inverse distance functions, and triangulations, or similar spatial estimating techniques) for hot spot delineation, as stated in Section 5.3 of the IASAP (DOE 2001a) and Draft BZASP (DOE 2001b). Data will be presented using the ER data management system (Section 11.0).

5.5 IN-PROCESS ANALYSIS AND CONFIRMATION SAMPLING

The characterization team will conduct confirmation sampling and analysis on remediated areas to verify the site has been cleaned up with respect to remediation goals. The confirmation sampling and analysis will provide a representative assessment of the magnitude and spatial configuration of the COC(s) after remediation. The characterization team will implement an in-process and confirmation sampling approach that combines remediation with field instrument analysis.

During remediation, the characterization team will collect soil samples and use field analytical instrumentation to determine when remediation goals have been achieved. Once remediation goals have been achieved based on field instrument data, confirmation sampling locations will be determined using statistical or geostatistical techniques as described in the IASAP (DOE 2001a) and Draft BZSAP (DOE 2001b). Post-remediation confirmation samples will be collected and analyzed onsite if appropriate data quality can be demonstrated. Otherwise, confirmation samples will be sent to an offsite laboratory for analysis. Offsite laboratory results will be verified and validated in accordance with Analytical Services Division (ASD) requirements.

The number and distribution of confirmation samples will be based on a 90 percent probability of detecting residual contamination greater than the cleanup goal and the size and spatial variability of the remediated site. Statistical or geostatistical sampling strategies will ensure the appropriate numbers of samples are collected from unbiased locations.

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5.6 SOIL AND DEBRIS REMEDIATION

This section describes the routine remediation actions covered by this ER RSOP. Excavation, treatment to meet regulatory and receiver site requirements, and disposal will be the dominant type of remedial action implemented through this ER RSOP. Thermal desorption may be considered if it is more technically and economically favorable for the given site condition, can be implemented within the constraints of the Site closure schedule, and is protective of human health and the environment. The Notification Letter will identify treatment, if any, chosen for each IHSS Group.

Routine remediation of soil and buried debris will consist of excavation and offsite disposal, with offsite treatment as required to meet regulatory and receiver site requirements. Soil remediation through excavation was successful at Trench 1 (DOE 1999c), Trenches 3 and 4 (DOE 1996a), Ryan's Pit (DOE 1997a), and the Mound Site (DOE 1997b) at RFETS. Thermal desorption may be used to treat VOC-contaminated soil to meet regulatory or receiver site requirements for offsite disposal or for onsite disposal (backfilling), depending on the economics, schedule constraints, and protectiveness of human health and environment.

Engineering and administrative controls will be implemented prior to and during excavation and treatment activities to control the spread of radiological and hazardous contaminants in accordance with job-specific work controls (Section 5.2). Remediation activities will meet the substantive requirements of ARARs.

5.6.1 Excavation, Offsite Treatment, and Disposal

The remediation process for soil and associated debris is shown on Figure 10. Soil and associated debris contaminated above agreed upon cleanup levels will be excavated and disposed offsite, with offsite treatment as necessary to meet regulatory or receiver site requirements. Soil and debris will be excavated with heavy machinery, including backhoes, front-end loaders, and excavators. Cranes and other lifting equipment will be used for debris removal as necessary. All excavated soil and debris will be segregated by size, material type, and waste type. The wastes will be transferred to rolloffs or other waste containers and will be managed onsite in accordance with substantive ARARS (Section 4.3) and dispositioned offsite. Soil and debris will be characterized in accordance with requirements described in Section 9 to evaluate compliance with regulatory or receiver site requirements. Contaminated soil and debris that do not require treatment will be transferred to rolloffs or other waste containers, managed in accordance with substantive ARARS (Section 4.3), and dispositioned offsite.

After soil and debris contaminated above agreed upon cleanup levels are removed, the excavation will be backfilled with onsite or offsite soils that meet backfill criterion (DOE 2001c). The backfilled excavation will be stabilized and revegetated to return the area to a condition comparable with the surrounding environment.

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5.6.2 Onsite Thermal Desorption

Onsite thermal desorption of soil to meet regulatory or receiver site requirements or for backfilling will be considered if it is shown to be expedient, economical, and protective of human health and the environment. Onsite thermal desorption and backfilling will be considered when site VOCs exceed agreed upon cleanup levels, radiological contamination is below Tier II ALs, and nonradiological contamination (excluding VOCs) is below Tier I ALs (e.g., metals, SVOCs, PCBs, etc.) (DOE 2001c). Onsite thermal desorption and offsite disposal may also be considered for VOC and radionuclide contaminated soil. Onsite thermal desorption was successfully demonstrated at Trenches 3 and 4 (DOE 1996a).

Areas of contaminated surface and subsurface soil and debris will be excavated with heavy machinery and transferred to an onsite thermal desorption treatment facility or will be remediated at the point of excavation. Transfer of soil will be by loader, backhoe, or conveyor belt. Thermal desorption will be used to remove VOCs from the soil. Thermal desorption units used for onsite soil remediation will be portable and will be transported to the site of waste generation where possible. The appropriate system will be selected to accommodate the specific volumes and types of soils to be remediated. To ensure the contaminants are not combusted (incinerated), Indirect Thermal Desorption will be used because it applies heat in a manner that isolates the flame from contaminated material, raising the contents' temperature above the contaminant's vapor point, then removing the contaminant vapor for condensing. VOCs will be removed from the soil within a closed system and will be either condensed into a liquid phase and/or collected on granular activated carbon. The closed system results in little to no volatile emissions to the atmosphere. Condensate removed from the system will be further treated by passing the liquid through an oil/water separator to remove dense non-aqueous phase liquids (DNAPLs) and light non-aqueous phase liquids (LNAPLs). DNAPLs and LNAPLs will be treated or disposed in an appropriate offsite facility. Residual liquids will be treated using an onsite water treatment system, or will be disposed at a K-H approved offsite disposal facility. Detailed specifications of the selected thermal desorption units will be described in a Notification Letter, when appropriate.

After soil has been treated, it will be sampled and analyzed to determine whether treatment was successful and regulatory and receiver site requirements or backfill criteria have been met. If receiver site requirements have been met, the waste will be packaged in accordance with waste management requirements, managed according to substantive ARARS (Section 4.3), and dispositioned offsite. If backfill criteria have been met, soil will be returned to the excavation or used as fill at some other acceptable onsite location (DOE 2001c). The backfilled excavation will be stabilized and revegetated (Section 5.6.1).

5.6.3 RCRA Units

There are several types of RCRA units that ER staff will have the responsibility or partial responsibility for closing. These units are listed in Table 3, illustrated on Figure 11, and consist of waste storage units and New Process Waste Lines (NPWL). These units were permitted under the RFETS RCRA Permit CO-97053001.

Table 3
RCRA-Regulated Units

IHSS Group Number	IHSS/PAC Number	RCRA Unit Number	RCRA Unit Description	ER Responsibility
000-4	PAC 000-504	374.3	New Process Waste Lines	Close unit
000-4	PAC 000-504	374.3	Valve Vaults 1 – 20	Close unit
500-4	IHSS 117.2	18.03	Asphalt Pad – Parking Area East of Building 551	Remove asphalt, characterize asphalt and soil, remediate soil as necessary
700-8	IHSS 214	750.1/750.2	Asphalt Pads – 750 Pad	Remove asphalt, characterize asphalt and soil, remediate soil as necessary
900-3	IHSS 213	15	Asphalt Pad – 904 Pad	Remove asphalt, characterize asphalt and soil, remediate soil as necessary
N/A	N/A	1	Asphalt Pad, PACS 1 Container Storage	Remove asphalt, characterize asphalt and soil, remediate soil as necessary
N/A	N/A	10	Asphalt Pad, B561 Container Storage	Remove asphalt, characterize asphalt and soil, remediate soil as necessary
N/A	N/A	18.01	Asphalt Pad associated with Remedial Action Decontamination Pad (RADP) Tanks	Remove asphalt, characterize asphalt and soil, remediate soil as necessary
N/A	N/A	18.04	Asphalt Pad – South of Unit 14, Centralized Waste Storage Facility	Remove asphalt, characterize asphalt and soil, remediate soil as necessary
N/A	N/A	21	Concrete Slabs – Building 788	Remove concrete, characterize asphalt and soil, remediate soil as necessary
N/A	N/A	48	Former Pondcrete Pump House Concrete Slab 308-A	Remove concrete, characterize asphalt and soil, remediate soil as necessary

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The NPWL units consist of 26 tanks, 20 valve vaults, and associated piping. The NPWL pipes and tanks are part of RCRA Unit 374.3. Closure of waste storage units within buildings is the responsibility of the decommissioning staff. Closure of the NPWL not inside buildings is the responsibility of ER.

The NPWL (Figure 11) consists of pipelines, tanks, and valve vaults. The NPWL transports LL aqueous waste to the liquid waste treatment facility in Building 374. Based on Site utility maps, it is estimated there is approximately 6,300 ft of pipeline.

RCRA-regulated waste is currently stored at the 750 Pad (IHSS Group 700-8), 904 Pad (IHSS Group 900-3), the asphalt pads east of Building 551, at PACS1, at the Remedial Action Decontamination Pad, and the Centralized Waste Storage Facility; and the concrete slabs at Building 788 and the Pondcrete Pump House. The waste management organization is responsible for removing the waste at these units. ER staff is responsible for characterizing and remediating asphalt, concrete, soil, and debris beneath the units.

The ER RSOP will serve as the permit modification vehicle for closure (or partial closure) of these RCRA units and to document what action was taken to support the RCRA permit modification. Remedial actions related to waste storage units and NPWL and associated tanks (in IHSSs, PACs, or under buildings) will be tracked. The strategy is to remediate RCRA-regulated tanks and sections of the NPWL associated with UBC sites and other IHSSs when those sites are remediated, archive the data, and close the RCRA unit when remediation of the units is complete. As tanks and sections of the NPWL are remediated, the specifics will be documented in the annual updates to the HRRs.

<u>Closure of RCRA-Regulated Units</u>

RCRA-regulated units governed by this RSOP will be closed in compliance with the closure performance standards described in this section. Unit-specific closure information, in the form of drawings and/or photographs of the unit or units to be closed, a description of the unit boundaries, applicable EPA waste codes, the selected closure option, and disposition of wastes generated as a result of unit closure, will be included with the Notification Letter. This unit-specific information, combined with the closure performance information provided in the following paragraphs, will serve as the closure description document for units closed under this RSOP.

Portions of a RCRA-regulated unit may be removed prior to submittal of the required unit-specific closure information through the consultative process and concurrence of the LRA. In such cases, LRA concurrence will be documented in an RFETS Regulatory Contact Record, a copy of which will be placed in the project-specific AR File.

Decommissioning will close RCRA-regulated units located within RFETS buildings prior to facility demolition. Decommissioning personnel will convert portions of units located beneath the building slabs or outside the building footprints (e.g., the valve vaults and underground piping associated with the Building 374 process waste system) to a RCRA stable configuration in

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accordance with the RSOP for Facility Component Removal, Size Reduction, and Decontamination Activities (DOE 2001d). RCRA stable configuration is the first step toward closure of permitted or interim status units, whereby wastes are removed from the unit and the possibility of future waste input is eliminated. For tank systems, this means the tank and its ancillary equipment have been drained to the maximum extent possible using readily available means, with the objective of achieving less than 1 percent holdup, and with no significant sludge and no significant risk remaining. Physical means, such as lock out/tag out or blank flanges, must then be used to ensure wastes will not be re-introduced to the system. RCRA stable requirements are defined in Part X of the Site's RCRA Part B Permit (CDPHE 1997).

Closure Options

Closure options for RCRA units include clean closure, removal according to the debris rule, removal without decontamination, and in-situ stabilization. These options are described below.

Clean Closure

RCRA-regulated units may be clean closed by documenting the absence of contamination or by decontaminating the unit.

Clean Closure Option #1: For units having a complete, detailed operating history, clean closure will be demonstrated when the LRA agrees the following criteria are met:

- A review of the RCRA Operating Record and building files indicates hazardous or mixed waste was never spilled in the unit, or complete documentation exists to demonstrate releases were adequately cleaned up (e.g., if a spill did occur, visible residual liquids and solid wastes were removed and the spill area was decontaminated); and

- A visual inspection of the unit and associated ancillary equipment notes the absence of hazardous or mixed waste stains and/or residuals.

Clean Closure Option #2: Units to be clean closed by chemical decontamination will be flushed and washed with a suitable decontamination solution to remove visible waste residuals and COCs, then rinsed with clean water. The final rinsate will be tested to determine whether:

- The pH of the rinsate is between 6 and 9; and

- The concentrations of priority pollutants (those managed in the unit) and heavy metals are below the RFCA Tier II ALs for groundwater, as defined in Attachment 5 of RFCA. Rinsate meeting the RFCA Tier II groundwater ALs for listed waste constituents associated with the unit and the LDR standards for characteristic waste (as required for disposal) will be considered “no longer contained in” and will be managed as nonhazardous waste.

The final rinsate will not exceed a volume of two gallons per 100 ft^2 of surface area rinsed, and for internal surfaces, such as tank systems, the final rinsate will not exceed a volume of 5 percent of the capacity of the system. If test results indicate the standard has been met, the unit will be

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considered clean closed. Units that cannot be decontaminated to meet the performance standard will be removed prior to building demolition and managed as hazardous or mixed waste. Rinsates and waste water will be treated onsite if appropriate facilities are available or will be disposed offsite at K-H approved facility.

Unit Removal in Conjunction with "Debris Rule" Treatment

Alternatively, RCRA-regulated units may be closed by removal and treatment according to the debris rule. The debris rule applies to unit equipment or structures that have no intended use or reuse, and are slated for removal and discard. To meet the debris rule standard, decontamination is conducted using any of the extraction or destruction technologies identified in Part 268.45 of 6 CCR 1007-3 (Table 1, Alternative Treatment Standards for Hazardous Debris).

If after treatment, ER personnel determine the equipment or structure meets the standard for a clean debris surface and it does not exhibit a hazardous waste characteristic it will no longer be considered a hazardous waste and will be managed as a solid waste. A "clean debris surface" is defined as "a surface that, when viewed without magnification, is free of all visible contaminated soil or hazardous waste except that residual staining from soil and waste consisting of light shadows, slight streaks, or minor discolorations, and soil and waste in cracks, crevices, and pits may be present provided that such staining and soil and waste in cracks, crevices, and pits is limited to no more than 5 percent of each square inch of surface area" (6 CCR 1007-3, Part 268.45).

In the event the standard is not met, the equipment or structure will be removed and managed as hazardous or mixed remediation waste. Treatment residuals generated from extraction and/or destruction technologies used in the closure of RCRA-regulated units will be characterized in compliance with 6 CCR 1007-3, Part 262.11, managed onsite in accordance with substantive ARARS (Section 4.3), and dispositioned offsite.

Unit Removal Without Onsite Treatment

RCRA units that are not decontaminated to meet the clean closure standard or debris rule standard may be removed, size-reduced (if necessary), and packaged for offsite disposal. Waste will be stabilized or treated to meet regulatory or receiver site requirements. In the event this waste cannot be immediately shipped directly to an offsite facility, it will be stored in accordance with substantive ARARS (Section 4.3) and dispositioned offsite.

Closure Documentation

A closure certification will be prepared for each RCRA unit. The closure certification will be submitted to the LRA for review and concurrence within 60 days after completion of the associated closure activities.

RCRA unit closure activities will be documented in the Closeout Report. Upon final closure of each RCRA-regulated unit, the Site's Master List of RCRA Units will be updated to reflect the new closure status of the unit, and the unit will be removed from the RCRA Part A and Part B

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Permits in accordance with the applicable hazardous waste regulations (6 CCR 1007-3, Section 100.63, Permit Modification at the Request of the Permittee).

5.6.4 Original Process Waste Lines, Sanitary Sewer System, and Storm Drains

The remediation strategy for OPWL, the sanitary sewer system, and storm drains is to remove soil contaminated above agreed upon cleanup levels and associated pipelines, and leave in place those segments with soil concentrations below agreed upon cleanup levels. There may be cases where soil contaminated above agreed upon cleanup levels and associated pipelines will not be excavated but may require a different action. In these cases, an ER RSOP modification or Proposed Action Memorandum (PAM) will be developed.

Original Process Waste Lines

The OPWL, shown on Figures 12 and 13-A through F, is a network of tanks, underground pipelines, and aboveground pipelines used to transport and temporarily store aqueous chemical and radioactive process wastes. The OPWL potentially transported a variety of wastes, including acids, bases, solvents, radionuclides, metals, oils, PCBs, biohazards, paints, and other chemicals (DOE 1992).

The OPWL network originally consisted of approximately 35,000 ft of pipeline. Parts of the OPWL were converted to NPWL or other systems (e.g., fire plenum deluge system), and will be remediated as part of those systems. The current OPWL system contains approximately 28,638 ft of pipeline. Approximately 13,317 ft of pipeline is included in IA Group 000-2. The remaining 15,321 ft of pipeline is included in other IA Groups.

Sanitary Sewer System

The sanitary sewer system (Figure 14) consists of approximately 36,480 ft of pipeline, and 25 valve vaults, pump vaults, and similar structures. This estimate includes only main pipelines. Remaining pipelines will be remediated with UBC sites or other IHSSs or PACs.

Storm Drains

There are 239 storm drains at RFETS totaling approximately 79,500 ft in length. Of these, 139 are part of IA Group 000-3 (Figure 14). The remaining 100 storm drains are part of other IA Groups. Storm drains may have been exposed to contaminated liquids because of spills, fires, contaminated surface-water runoff, and contaminated sediments. Potential wastes that have been documented in storm drains are silver paints (DOE 1992).

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Draft Environmental Restoration RFCA Standard Operating Protocol For Routine Soil Remediation

Draft

Figure 12

Original Process Waste Lines

July 5, 2001

Map ID: 01-0698

CERCLA Administrative Record document, SW - A - 004355

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ROCKY FLATS ENVIRONMENTAL TECHNOLOGY SITE

GOLDEN, COLORADO

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Figure 13-A
Original Process Waste Lines
July 4, 2001

Map ID: 2k-0383

CERCLA Administrative Record document, SW - A - 004355

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Figure 13-B
Original Process Waste Lines
July 4, 2001

Map ID: 2k-0383

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Figure 13-C
Original Process Waste Lines
July 4, 2001

Map ID: 2k-0383

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Figure 13-D
Original Process Waste Lines
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Map ID: 2k-0383

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Figure 13-E
Original Process Waste Lines
July 4, 2001

Map ID: 2k-0383

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Draft Environmental Restoration RFCA Standard Operating Protocol For Routine Soil Remediation

Figure 13-F
Original Process Waste Lines
July 4, 2001

Map ID: 2k-0383

CERCLA Administrative Record document, SW - A - 004355

U.S. DEPARTEMENT OF ENERGY
ROCKY FLATS ENVIRONMENTAL TECHNOLOGY SITE

GOLDEN, COLORADO

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Remediation Strategy

The remediation strategy for the OPWL, sanitary sewer system, and storm drains consists of two approaches:

1. The sections of OPWL, sanitary sewers, and storm drains associated with IHSSs, PACs, and UBC sites will be remediated along with the IA Groups. Additionally, sections of pipeline adjacent to or close to an IHSS, PAC, or UBC site will also be included with the IA Group remediations wherever possible. This approach will reduce planning, mobilization, and field costs and schedules. Pipeline segments that will be included with IHSS Groups will be documented in the appropriate notification.
2. Remaining sections of contaminated soil and associated OPWL, sanitary sewers, and storm drains will be remediated as infrastructure constraints are eliminated or reduced.

Decommissioning Responsibilities

Decommissioning will remove all OPWL, sanitary sewers, and storm drains that are within 3 ft of the existing grade within a building footprint or to the nearest junction. All remaining pipelines will be cut off at the building footprint boundary, or the nearest junction outside the building footprint, and sealed with a watertight permanent seal. Pipeline termination points will be surveyed using traditional or Global Positioning System (GPS) surveying methods. Decommissioning will provide a map of all pipeline and other utility terminations to ER.

Environmental Restoration Responsibilities

Soil surrounding pipelines contaminated above agreed upon cleanup levels will be excavated, treated as necessary, and disposed offsite. Pipelines associated with contaminated soil will also be excavated. Subsurface soil requiring remediation will be excavated with heavy machinery, including backhoes, front-end loaders, and bulldozers. Cranes and other lifting equipment will be used for pipeline removal as necessary. All efforts will be made to eliminate confined space entries. Engineering and administrative controls will be implemented prior to and during excavation activities to control the spread of radiological and hazardous contamination in accordance with job-specific HASPs, job reviews, and RWPs.

Excavated soil and pipelines will be segregated by size, material type, and waste type. Soil and pipelines will be evaluated to determine whether treatment is required to meet regulatory requirements and will be characterized in accordance with requirements described in Section 9.0. Soil and pipelines that do not require treatment will be transferred to rolloffs or other waste containers and transferred to the waste management organization for storage and subsequent transportation to a disposal facility. Soil that does require treatment to meet regulatory requirements will be stabilized or treated, then transferred to the waste management organization, managed in accordance with substantive ARARS (Section 4.3), and dispositioned offsite. Pipelines will be size reduced then transferred to the waste management organization, managed onsite according to substantive ARARS (Section 4.3), and dispositioned offsite. Pipelines that are left in place will be sealed and their location surveyed.

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Based on historical information, it is anticipated sanitary sewers and storm drains will be significantly less contaminated (if contaminated at all) than OPWL. They currently have sewage or stormwater running through them. These lines will be flushed with water to remove solids. After a thorough flushing, a final rinse will be applied and the rinse water will be analyzed. Pipelines will be grouted to eliminate potential contaminant migration pathways.

5.7 BUILDING FOUNDATION AND SLAB REMOVAL

Structural materials within 3 ft of the existing ground surface will be removed during decommissioning activities, including building slabs and foundations unless otherwise required by ER staff. In the event that decommissioning of a facility with a high potential for UBC occurs well before scheduled soil remedial actions, ER staff may specify that building slabs be left in place to provide continued containment of potentially contaminated soil.

Currently, several building slabs and foundations remain from previous decommissioning activities or will be left in place in advance of soil remediation efforts. The ER staff will characterize and remove the following slabs and foundations:

- B123;
- B889;
- B779;
- B690 Area slabs;
- B910 and associated slabs;
- Guard shack slabs at inner East and West Gates;
- B865; and
- Additional slabs, as necessary.

Slab and foundations will be characterized in accordance with methods described in the IASAP (DOE 2001a). Removal will involve large mechanical equipment that may include excavators and front-end loaders to demolish, break up, segregate, and load concrete, steel, and other slab and foundation materials into waste containers or staging areas. Front-end loaders may be equipped with the following attachments:

- Pulverizers that crush concrete and separate rebar and encased steel beams;
- Shears that sever metals, structural steel, wood, rubber, and plastic;
- Grapples that serve as an all-purpose tool for demolition and material handling; and
- Rams that demolish concrete structures.

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Other techniques may be considered and will be documented in the Notification Letter. Concrete may be recycled in accordance with the RSOP for Recycling Concrete (DOE 1999d) or will be disposed.

5.8 FOUNDATION DRAINS

Foundation drains are associated with many RFETS buildings and include footing drains, building sumps, and subdrains. Foundation drain systems were constructed to intercept and transport groundwater away from building foundations to prevent flooding of building basements. Typically, foundation drains consist of a trench or series of trenches, backfilled with gravel or other free-draining material. A slotted or perforated pipe is generally installed at the bottom of the trench.

Water collected in the foundation drains flows by gravity to an outfall at a lower elevation, while water in sumps is generally pumped to a discharge location. The intercepted water is discharged to a storm sewer, sanitary sewer, building sump, or surface outfall. RFETS foundation drains are listed in Table 4, and the locations are illustrated on Figure 15.

Table 4
Foundation Drains

Station Identification	Description
Foundation Drain (FD)-111-1	Drain in gully outside security fence north of the northwestern corner of Building 111 halfway to Sage Avenue
Building Sump (BS)-111-2	Sump located in southeastern corner of the Building 111 basement
FD-371-1	Southeastern corner of Buildings 371/374
FD-371-2	Drain daylights in the gully southeast of the southeastern corner of Building 374
FD-371-3	East of Building 374
FD-371-4	Southwest of FD-371-3 on the western side of the access road to the 517/518 substation (buried)
FD-371-5	Northeast of the 517/518 substation (buried)
FD-371-6	Northeast of the 517/518 substation (buried)
FD-371-MC	Metal culvert near outfall FD-371-1
FD-371-COMP	Northeast of FD-371-4, 5, and 6
FD-444-1 FD-444-460	South of the southwestern corner of Building 444, renamed FD-444-460
BS-444-2	Sump inside Building 444 at the southeastern corner of the "snake pit"
FD-516-1	Southern side of the road into the 516 power substation
FD-559/561	East of Building 561, Door 1, and south of Building 559, Door 6
FD-707-1 750 Culvert	Storm drain outlet across the road from the eastern side of the 750 parking lot
BS-707-2	Sump in a pump pit between the cooling tower and Building 707
BS-707-3	Sump in the old process drain manhole outside Door 3 to Building 778
FD-771-1	Drain located approximately 50 ft southwest of the southwestern corner of the old 773 guard post
BS-771-2	Sump in Room 146, Building 771
BS-771-3	Sump in elevator pit
BS-771-4	Drain located west of FD-771-1

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Station Identification	Description
FD-774-1	Drain located east of Building 770
FD-774-2	Located at the northeastern corner of Building 774
FD-774-3	Located on the hillside northeast of Building 774
FD-779-1	Drain line that runs between Ponds 207C and 207A on the hillside north of the SEP
FD-790	Drain located in the manhole on the southwestern corner of Building 790
FD-850-1 FD-860-1	Drain located approximately 50 ft south of Building 860
BS-865-1	Sump in the manhole on western side of Building 865
BS-865-2	Drain located outside Door 1 of Building 865
FD-881-1	Drain on hillside south of the middle of Building 881
BS-881-2	Sump in elevator shaft by the boiler room in Building 881
BS-881-3	Sump under the stairway in the northeastern corner on the first floor of Building 881
BS-883-1 FD-883-1	Located in manhole outside Door 17 on the southwestern corner of Building 883
FD-886-1	Located at the northeastern corner of Building 875
FD-886-2	Located on the western side of Building 886
BS-887-1	Sump in the northwestern corner of the lowest section of Building 887
FD-910	Manhole on the northern side of Building 910
FD-991-1	Drain in gully east of the northeastern corner of Building 991
BS-991-2 FD-991-2	Located in the southeastern corner of the basement of Building 991

Decommissioning will remove all foundation drains if they are within 3 ft of the existing grade within a building footprint or to the nearest junction. All remaining drains will be cut off at the building footprint boundary, or the nearest junction outside the building footprint, and sealed with a watertight permanent seal. Drain termination points will be surveyed using traditional or GPS surveying methods. Decommissioning will provide a map of all foundation drain terminations to ER.

Accessible foundation drains, associated building sumps, surface outfalls, and surrounding drains, sumps, or outfalls with soil contamination above agreed upon cleanup levels will be excavated. To reduce the possibility for potential residual migration through footing drain corridors, the bedding material will be excavated and replaced with compacted fill, or pressure grouted. Associated storm drains and sanitary sewers will be addressed as discussed in Section 5.6.4.

5.9 UNDERGROUND STORAGE TANKS

Underground storage tanks (USTs) at RFETS include petroleum, water, and empty hazardous waste tanks. Existing records will be reviewed to identify the location of all known tanks and the type(s) of materials they contain or contained. Tanks that contained hazardous constituents should be associated with the OPWL and NPWL, and will be remediated in accordance with the provisions in Section 5.6.3 or 5.6.4. Water tanks will be drained and either removed or filled with an inert solid material, such as sand or foam.

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The Colorado Department of Labor and Employment, Oil Inspection Section (7 CCR 1101-14) regulates the closure of petroleum USTs. Assessment will consist of one Geoprobe® sample taken on each side of each tank, as close to the tank as possible and in the backfill, if accessible. The Geoprobe® will be driven at least to the bottom of the original trench for each tank. One soil sample will be collected at the bottom of the fill, or at an equivalent depth if outside the backfill, or 1 foot above the groundwater (if present above the bottom of the fill material). Soil and groundwater samples will be analyzed for total petroleum hydrocarbons (TPH). Tanks with sample results below 5,000 parts per million (ppm) TPH will be closed in place.

In accordance with Attachment 13 to RFCA, the Site's 20 petroleum USTs have been drained and filled with polyurethane foam. Although soil and groundwater samples from the required site assessment met the 5,000 ppm TPH standard (DOE 1997c and Safe Sites 1996), the data will be reviewed during ER characterization IASAP addenda activities to determine whether this information is sufficient to support a decision to close the tanks in place, or whether additional information is required to make this decision. If additional characterization and/or remediation is indicated, it will be conducted in accordance with the IASAP (DOE 2001a) and the following:

- The Oil Inspection Section will be notified within 10 days before closure of the tank system.
- When UST remediation is required, a Notification Letter will be sent to the LRA in lieu of a PAM. Accelerated action decisions will be conducted as part of the consultative process.

5.10 PREVIOUSLY UNIDENTIFIED CONTAMINATION

Areas outside of IHSSs, PACs, and UBC sites that may require remediation may be discovered during Site characterization, remediation, construction, decommissioning, and other Site activities. When new areas requiring remediation are found, these areas will be addressed in accordance with the IASAP (DOE 2001a) and Draft BZSAP (DOE 2001b) and this RSOP.

Areas requiring remediation that are identified during ER characterization or remediation of IHSS Groups will result in extension of the AOC and will not require additional administrative paperwork. The expanded AOC will be documented in the Closeout Report.

When potential areas are identified by other sources (construction, decommissioning), analytical data from the area will be compared to RFCA Tier II ALs or agreed upon cleanup levels. Areas with soil contamination above RFCA Tier II ALs or agreed upon cleanup levels will trigger further evaluation in accordance with to RFCA Attachment 4 – Environmental Ranking, RFCA Attachment 6 – No Action/No Further Action/No Further Remedial Action Decision Criteria for Rocky Flats Environmental Technology Site (DOE et al. 1996), Appendix 3 of the IGD (DOE et al. 1999), the IASAP (DOE 2001a) and Draft BZSAP (DOE 2001b).

If a new area is identified, a PAC number will be assigned and the PAC will be added to the HRR. An IASAP or BZSAP addendum will be prepared and forwarded to the regulatory

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agencies. The area will be characterized and remediated in accordance with the IASAP (DOE 2001a), Draft BZSAP (DOE 2001b), and this RSOP. After characterization, a accelerated action decision will be made. If remediation is required, a notification of the remediation target will be sent to the LRA. Areas will be remediated in accordance with methods in this RSOP. The Closeout Report will describe characterization and remediation activities and results.

5.11 CONFIRMATION SAMPLING

Post-remediation confirmation sampling will be conducted at AOCs associated with IHSSs, PACs, and UBC sites. In-process soil samples will be collected and analyzed during remediation to verify cleanup below remediation goals. Post-remediation confirmation samples will also be collected and analyzed. The combination of in-process and confirmation samples will ensure residual contamination levels are below remediation goals. Confirmation sampling procedures are described in the IASAP (DOE 2001a) and Draft BZSAP (DOE 2001b).

5.12 BACKFILLING

Remediated areas requiring backfill will not be backfilled until confirmation sampling indicates remediation objectives have been achieved. Processing and placement requirements will be established based on the design requirements for the backfill, as defined in the appropriate project work control documents. To ensure the backfill quality meets compaction requirements, the backfill will be geotechnically tested, as necessary, prior to placement and during backfill operations. After placement of the backfill, soil will be placed on top of the backfill to ensure the backfilled areas will blend in with the surrounding topography and support vegetation. The depth and specifications of this layer will be addressed in the final site configuration and remedy documentation.

The three potential backfill materials considered are:

- Recycled concrete (in deep basements);
- Onsite soil; and
- Offsite soil.

5.12.1 Recycled Concrete

The RSOP for Recycling Concrete (DOE 1999d) addresses the post-demolition disposition and placement of concrete. Table 5 lists the concrete free release limits (DOE 1999d). Concrete below the free release limits is considered nonradioactive, nonhazardous, non-beryllium-contaminated, and non-TSCA regulated. Each decommissioning or remediation project that generates concrete for recycling must demonstrate that the free release thresholds are met. Concrete available for recycling will be stockpiled as specified in the RSOP for Concrete Recycling (DOE 1999d).

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Table 5
Concrete Free Release Limits Summary

Contaminant	Requirement Source	Unrestricted Release Threshold		
Radionuclides		Total Average disintegrations per minute (dpm)/100 cm^2	Total Maximum dpm/100 cm^2	Removable dpm/100 cm^2
Transuranics	DOE Order 5400.5 (DOE 1998a), Figure IV-1 DOE "No-Radioactivity Added" Waste Verification	100	300	20
Thorium-Natural		1,000	3,000	200
U-Natural		5,000	15,000	1,000
Beta-Gamma Emitters		5,000	15,000	1,000
Tritium		N/A	N/A	10,000
Hazardous Waste	6 CCR 1007-3, Parts 261 through 268	No listed hazardous waste or characteristic hazardous waste is present.		
Beryllium	10 CFR 850.31, as interpreted by a DOE letter dated January 4, 2001	The unrestricted release limit for building materials is set at 0.2 µg/100 cm^2.		
PCBs	40 CFR 761	The release level for PCBs will be determined for each closure project based on applicable regulatory requirements.		
Asbestos Containing Material	40 CFR 763 5 CCR-1001-10	No sample in a sample set representing a homogeneous medium results in a positive detection (i.e., >1percent by volume).		

Areas proposed and selected for backfilling with recycled concrete must meet the following minimum criteria:

- Backfill is required to meet the final grading requirement.
- There are no impacts to surface water.
- Restoration activities and verification sampling are complete, and the data have been verified and validated (DOE 1999d).

It is anticipated that concrete from ER remediation will be used as backfill for deep building basements and will not be placed within 3 ft of the surface. If concrete from an ER site meets the minimum criteria listed above, the rubble stored in the recycled concrete storage areas will be processed by crushing. The final product will be a well-graded material with all particle sizes represented. The smaller particles tend to fill in the empty spaces around the larger particles, resulting in fewer voids after placement and compaction. Backfill with fewer voids has greater compaction densities, tends to handle greater surface bearing loads, and has minimal post-placement settling. Final grain size distribution requirements and compaction specifications will be established in the appropriate work control documents (DOE 1999d).

Transport of the backfill material from the stockpile will be performed in accordance with the RSOP for Recycling Concrete (DOE 1999d). The material will be transported from the stockpile area in end-dump trucks or other appropriate vehicles and deposited in the backfill area. The loads will be covered or sprayed with water or surfactant prior to transport to minimize the

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potential for dust. Roads used to transport the backfill may also require dust control, such as application of surfactant or water, speed reduction, and periodic sweeping (DOE 1999d). A rubber-tired front-end loader or bulldozer will place the material into the backfill area.

5.12.2 Onsite Soil

Use of onsite soil as backfill will minimize transportation and air quality impacts. Excavated soil may be staged and covered with plastic tarps to prevent air dispersion pending use as backfill. In accordance with the Draft RSOP for Asphalt and Soil Management (DOE 2001c), soil determined to be nonregulated (i.e., nonhazardous or concentrations below background) may be used as backfill material anywhere onsite. Soil with contaminant concentrations above background, but below RFCA Tier I ALs, may also be used as backfill within the IHSS, PAC, UBC site, or OU where it was generated. Soil treated to eliminate VOCs through thermal desorption that meet backfill requirements may also be used (DOE 2001c).

5.12.3 Offsite Soil

Offsite soil used for backfilling will be characterized to establish that it is comparable to RFETS background soil values (DOE 2001a). Soil with analytical results greater than background plus two standard deviations will not be used. Additionally, soil will undergo geotechnical evaluation to ensure stability requirements are met. Soil sources will be chosen from local areas to minimize transportation and air quality impacts. Efforts will be made to choose weed-free backfill material. Offsite soil will be staged onsite as necessary to ensure a consistent supply of backfill material.

5.12.4 Stabilization

Remediated areas will be stabilized, as necessary, to prevent erosion. Stabilization techniques will include grading, compaction, and revegetation. Remediated areas in the IA will be stabilized using a temporary vegetative cover. Remediated areas in the BZ will be stabilized using a permanent vegetative cover. The short-term vegetative cover will prevent erosion and weed invasion until completion of the end-state revegetation as part of the final remedy.

Topsoil will be reserved from areas that support vegetation at IHSSs and PACs. The top 18 to 24 inches of topsoil, except where the topsoil is contaminated, will be stockpiled and kept separated from the remaining overburden material. Topsoil stockpiles will be protected from wind-borne weed seed sources and wind erosion by covering the stockpile with tarps or a mulch-stabilizer. If topsoil is contaminated, soil will be imported from a local supplier. Efforts will be made to ensure the imported topsoil is free of weeds.

Once an area has been backfilled, the subsoil will be ripped or scarified to a depth of 8 inches to relieve soil compaction before topsoil placement. Topsoil will then be placed as evenly as possible using reserved or imported soil. Care will be taken to avoid compaction of this layer.

Canada Bluegrass (*Poa compressa)* or other approved seed will be applied to the topsoil by broadcast seeding at a rate of 18.0 pure live seed pounds per acre. The area will then be raked to ensure the seed is buried prior to mulching.

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Certified weed-free straw mulch, excelsior, coarse wood fiber, or hydromulch will be applied as final step after seed placement. Straw mulch will be threshed wheat or oat straw that is free of excessive crop seed heads. Mulch may be mechanically crimped to anchor it to the soil. However, in large areas, on steep slopes, and where high winds are expected, hydromulching or overspraying with a tackifier may be necessary.

5.13 DECONTAMINATION

Reusable remediation equipment will be decontaminated in accordance with OPS-FO.03, *Field Decontamination Operations*. Decontamination water generated during sampling will be managed in accordance with OPS-PRO.112, *Handling of Field Decontamination Water*. Excavation equipment will be decontaminated between project locations at the Decontamination Pad in accordance with OPS-PRO.070, *Equipment Decontamination at Decontamination Facilities*.

5.14 CLOSEOUT REPORT

A Closeout Report will be written for each IHSS Group remediation in accordance with RFCA and will be submitted once at the end of each FY. Additionally, each IHSS, PAC, and UBC site will be individually dispositioned through the HRR process.

The expected outline for a Closeout Report is shown below. The format may change to meet the needs of the ER Program.

- Introduction;
- Characterization Data – which will include maps and tables of characterization data;
- Remedial Action Description – which will include a description of the remediation, the rationale for the remediation, and a map of the target remediation area.
- Map of Remediation Area – which will include a map of the final remediation area;
- Confirmation Sampling Data – which will include confirmation sampling analysis data and maps, and a comparison to cleanup goals;
- Verification of Treatment Process (if applicable) – which will include a description of the treatment process and analytical results to confirm that treatment was successful;
- Deviations from the ER RSOP – which will include exceptions to the ER RSOP not covered in a modification. It is anticipated that these deviations would be field changes;
- Description of Site Condition After Remediation – which will include a map of residual contamination above background, method detection limits, and Tier II ALs, if any;
- Site Reclamation – which will include a description of stabilization and revegetation activities;

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- Dates and Durations of Specific Activities (approximate) – which will include a history of major remediation activities;
- Final Disposition of Wastes – which will describe where the waste will be disposed (actual or anticipated); and
- Table of No Longer Representative Sample Locations and Sample Numbers – which will include a list of sampling locations that have been remediated. These data will be used to mark database records so they are not used in the CRA or other Site analyses.

Upon completion, the Final Closeout Report will be submitted to the LRA for approval and will be placed in the AR.

5.15 ENVIRONMENTAL STEWARDSHIP

This section provides information on the elements and objectives of Environmental Stewardship at RFETS. Environmental Stewardship at RFETS includes current provisions for waste minimization, recycling, and future provisions for long-term protection of the environment. RFCA is considered the primary authority for projects in the Site mission of cleanup and closure. The parameters of this agreement reflect the Rocky Flats Vision, which strives to:

- Achieve accelerated cleanup and Site closure in a safe, environmentally protective manner and in compliance with applicable state and federal environmental laws;
- Ensure that RFETS does not pose an unacceptable risk to the citizens of Colorado or to Site workers; and
- Work toward the disposition of contamination, wastes, buildings, facilities, and infrastructure consistent with community preferences and national goals.

Environmental Stewardship is an essential part of the objectives and goals of the Rocky Flats Vision and RFCA, and therefore a key element in the development and implementation of this RSOP. It encompasses the concept that society, acknowledging the impacts of its activities on environmental conditions, should adopt practices that eliminate or reduce negative environmental impacts.

Environmental Stewardship is implemented at RFETS through existing DOE- and contractor-approved programs and is embodied within the intent of RFCA. This RSOP supports the established Environmental Stewardship principles by incorporating the following goals:

- Reduce risks to human health and the environment in compliance with RFCA and environmental laws;
- Preserve and enhance environmental quality through implementation;
- Minimize waste, conserve natural resources and energy, and recycle and use recycled materials as feasible during implementation;

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- Educate employees and subcontractors responsible for implementation regarding responsible care of the environment;
- Support community concern regarding responsible care of the environment through community involvement and responsiveness as part of the RFCA review and approval process; and
- Continually assess the environmental impacts and opportunities during implementation with the goal of continuous improvement.

Environmental Stewardship also consists of post-remediation activities and long-term monitoring and care of the Site. Post-remediation stewardship of remediated areas includes routine monitoring under IMP, maintenance of revegetated areas, and if necessary, additional monitoring around in-situ stabilization remediations. Long-term monitoring requirements will integrate CERCLA and RCRA closure requirements with CRA requirements. Long-term monitoring will be described in the final CAD/ROD.

5.15.1 Stewardship During Closure Project Activities

Closure stewardship activities that will be conducted on an ongoing basis through the end of Site closure will be described in the RFETS Stewardship Plan (in preparation). Ongoing activities include preventing access to the Site and preserving natural resources. Additionally, routine activities conducted during accelerated actions covered under this RSOP contribute to Environmental Stewardship goals by reducing risk and minimizing potential long-term effects to the environment. These activities are briefly described below.

RFETS Stewardship Plan

The RFETS Stewardship Plan will describe current closure stewardship and post-closure stewardship activities. DOE is developing the Stewardship Plan in consultation with the Stewardship Working Group. The Stewardship Plan will include the stewardship policy, current stewardship activities and requirements (e.g., records management, land management, engineering controls, and institutional controls) as well as the post-closure stewardship policy, activities and requirements.

Ongoing Site Access Control

RFETS currently has access restrictions that are required for security and safety reasons. These access restrictions are expected to be in place consistent with keeping RFETS a controlled area in accordance with 10 CFR 835, *Occupational Radiation Protection*. Access controls restrict admission to the Site through gate access restrictions and perimeter patrols in accordance with the *RFETS Security Manual*.

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Resource Management

Ecological resource management that includes vegetation and habitat management is an ongoing Environmental Stewardship activity at RFETS. These activities are conducted in accordance with the Site's *Ecological Resource Management Plan, 2001 Annual Vegetation Management Plan* and the *Site-Wide Wetland Comprehensive Plan.*

Source Removals

Surface and subsurface soil and associated debris contaminated above agreed upon ALs will be excavated (Section 5.6). This source removal will reduce risk in the immediate area and contribute to sitewide risk reduction. The Closeout Report will contain maps of all sampling locations and results above background plus two standard deviations for inorganics and radionuclides, method detection limits for organics, Tier II AL values, and Tier I AL values. Analytical data will also be included. The Closeout Report will document that remediation goals have been achieved and the extent of residual contamination.

Plugging of Pipelines

Pipelines that are left in place will be plugged to eliminate potential contaminant migration pathways (Sections 5.6). Pipeline ends will be surveyed, plotted on maps, and documented in the Closeout Report. This will ensure remaining pipeline maps are available for evaluation during other Site studies and for Environmental Stewardship planning.

Work Controls

Work controls (Section 5.1, 5.2, and 8.0) are used routinely at RFETS to mitigate or control releases to the environment during remediation projects. Work controls along with BMPs will be used to prevent impacts to surface water and air from erosion or releases at remediation sites. The use of work controls and BMPs contributes to Environmental Stewardship goals by reducing long-term risk onsite and in the environment.

Confirmation Sampling

Confirmation sampling (Section 5.11) will be conducted at remediated areas in accordance with the IASAP (DOE 2001a) and Draft BZSAP (DOE 2001b). Confirmation sampling and analysis will contribute to long-term stewardship by documenting the extent of residual contamination, if any, in the remediated area. These data will be included in the Closeout Report (Section 5.14) and the AR and will be available for Environmental Stewardship planning.

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Stabilization and Revegetation of Remediated Areas

Areas that have been remediated will be stabilized and revegetated to reduce erosion, protect surface water resources, and prevent air dispersion of residual contamination (Section 5.12.). While this stabilization and revegetation is temporary, it contributes to Environmental Stewardship goals by reducing impacts to surface water, air, and biota. The final Site topography and vegetative cover will be documented in the final Land Configuration Design.

Performance Monitoring

Performance monitoring (Section 6.0) will be used, as required, to monitor air, surface water, groundwater, or biota in the vicinity of remediation areas. Performance monitoring is used to isolate the impacts of individual projects where projects are likely to impact surface water. Performance monitoring contributes to long-term stewardship by 1) alerting project personnel to potential problems, and 2) providing information on areas of concern that may be used in Environmental Stewardship planning. Data collected during performance monitoring will be documented in the RFETS Quarterly Environmental Monitoring Report.

Ongoing Compliance Monitoring

Compliance monitoring contributes to Environmental Stewardship by (1) alerting project personnel to areas that may require remediation, and (2) providing information on surface water, groundwater, air, and biota quality that may be used in Environmental Stewardship planning. Data collected during compliance monitoring will be documented in the RFETS Quarterly Environmental Monitoring Report.

5.16 SCHEDULE

The schedule for remediation of IA IHSS Groups is shown on Figure 16, and the schedule for remediation of BZ IHSS Groups is shown on Figure 17. These figures illustrate the 2005 Working Schedule for RFETS Closure, but may change based on the decommissioning schedule and characterization acceleration opportunities.

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Figure 16
Industrial Area Schedule
July 8, 2001

Map ID: 2k-0814

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Figure 17
Buffer Zone Schedule
June 28, 2001

Map ID: 01-0498

CERCLA Administrative Record document, SW - A - 004355

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6.0 ENVIRONMENTAL PROTECTION AND MONITORING

Environmental impacts will be minimized during implementation of this RSOP by using controls and approaches designed to prevent release of contaminants to air, surface water, groundwater, and the environment. Monitoring activities will be coordinated with compliance staff. The environmental monitoring program includes routine monitoring for air, surface water, groundwater, and ecology. If additional monitoring is necessary for a given project, appropriate media-specific monitoring specifications are developed that complement environmental monitoring. Descriptions of the monitoring programs and requirements and protective measures are discussed in the following sections. Figure 18 illustrates the decision framework for environmental protection actions.

6.1 AIR

Environmental remediation activities have the potential to generate total suspended particulate (TSP), particulate matter (less than 10 micrograms [PM_{10}]), radionuclide, VOC, hazardous air pollutant (HAP) emissions, oxides of nitrogen (NOx), and carbon monoxide (CO).

6.1.1 Particulate Emissions

Environmental remediation activities will generate dust, including TSP and PM_{10}. Opacity and particulate emission are governed by 5 CCR 1001-3, Regulation No. 1. Section III of Regulation No. 1 addresses the control of particulate emissions and requires that practical, economically reasonable, and technologically feasible work practices are used to control dust emissions. All remediation projects will need to assess the dust generation potential from activities of soil excavation, transport, and handling, and implement dust control measures accordingly.

Radionuclide emission requirements are addressed in the NESHAPs for Emissions of Radionuclides Other Than Radon From Department of Energy Facilities (40 CFR Part 61, Subparts A and H [CCR 5 1001-10, Regulation No. 8, Part A, Subparts A and H]). This regulation requires RFETS to limit radionuclide emissions to an annual public dose (dose to an offsite member of the public) standard of 10 mrems per year (mrem/yr); monitor significant emission points; notify EPA and CDPHE prior to construction or modification of radionuclide sources with emissions exceeding a 0.1-mrem/yr EDE threshold; and annually report the Site's radionuclide emissions, demonstrating compliance with the 10-mrem standard.

The existing RAAMP sampler network will be used for ambient air monitoring during environmental remediation. The RAAMP sampler network continuously monitors airborne dispersion of radioactive materials from the Site into the surrounding environment. The RAAMP network consists of 37 samplers, as shown on Figure 19. Fourteen of these samplers are deployed at the Site perimeter and used to confirm Site compliance with the 10 mrem/yr standard. Filters from the 14 perimeter RAAMP samplers are collected and analyzed monthly for U, Pu, and Am isotopes. The radiological NESHAPS regulations require that an air quality assessment be conducted to evaluate potential emissions from planned projects. Project-specific ambient monitoring can also be triggered by soil screening measurements performed for

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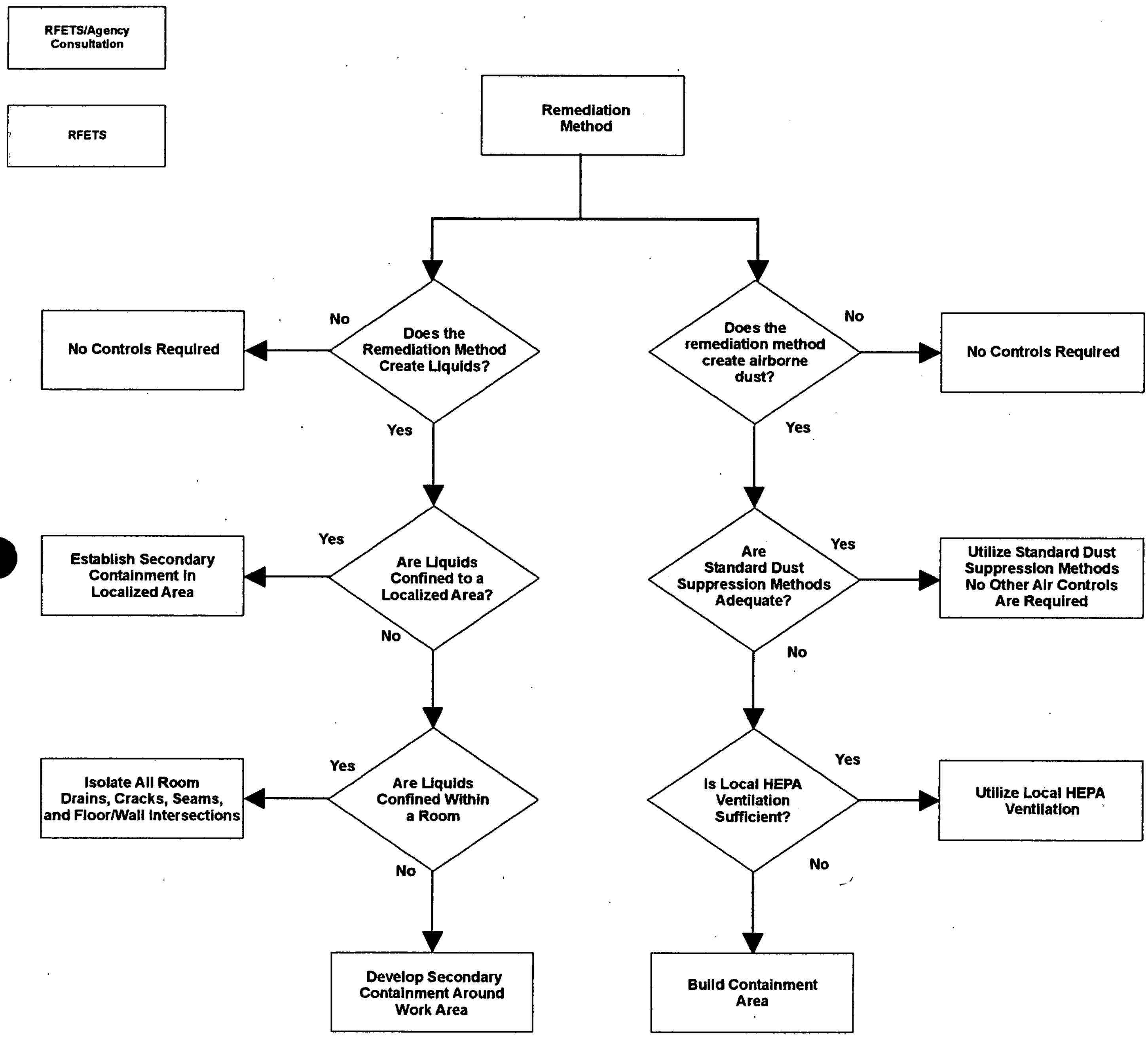
Figure 18
Draft ER RSOP
Environmental Protection Action and Decision Framework



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radiation worker protection. Enhanced radionuclide ambient air sampling will be performed on an as-needed basis.

6.1.2 Control of Emissions

Some combination of the following methodologies may be used to control fugitive dust:

- Controlled water spraying will be used to minimize fugitive dust emissions during environmental remediation.
- Debris, if encountered during remediation activities, will be loaded into waste rolloff containers (Section 5.6) and covered to control fugitive dust emissions.
- Environmental remediation activities will be terminated during periods of high winds, if necessary to control fugitive dust.
- Dust control devices or shrouds may be used on individual equipment.

All environmental remediation projects will establish a maximum wind velocity action level. All remediation activities will cease when the action level is exceeded. Dust will be predominantly controlled through the application of water. Depending on location of the remediation, a water truck (or wagon) or hydrant will be used. Water will be applied in a controlled manner to manage dust without resulting in excess ponding or runoff.

Environmental remediation activities may also include operation of heavy equipment, vehicles, and similar equipment. Although emissions from equipment will not generate sufficient criteria emissions to affect National Ambient Air Quality Standards (NAAQSs), temporary stationary fossil fuel-fired equipment use (or fuel use) will need to be tracked to ensure emissions remain within permitted limits, or that appropriate notices or permit modifications are filed. In addition, opacity will be limited to below 20 percent.

6.2 SURFACE WATER

Water erosion of contaminated soil during remediation could adversely impact water quality. Impacts to surface water will be controlled using standard construction methods for stormwater pollution prevention, including silt fences, berms, hay bales, diversion ditches, and BMPs. Table 6 identifies potential BMPs for construction activities that can be used as necessary. The selected controls will be coordinated with the compliance staff. It is anticipated that decommissioning projects will already have surface water controls around the majority of the project areas, and only minor modifications may be necessary prior starting remediation activities.

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Table 6
Best Management Practices

Control/Description	Primary Use	Application	Design Criteria	Limitations/Maintenance
Interceptor Swale – A small V-shaped or parabolic channel that collects runoff and directs it to a desired location. It can have a natural grass lining or, depending on slope and design velocity, a protective lining of erosion matting, stone, or concrete.	To direct sediment-laden flow from disturbed areas into a controlled outlet or to direct clean runoff around disturbed areas. Because a swale is easy to install during early grading operations, it can serve as the first line of defense in reducing runoff across disturbed areas. As a method of reducing runoff across the disturbed construction area, it reduces the requirements of structural measures to capture sediment from runoff because the flow is reduced. By intercepting sediment-laden flow downstream of the disturbed area, runoff can be directed into a sediment basin or other BMP for sedimentation, as opposed to long runs of silt fences, straw bales, or other filtration methods. Based on site topography, swales can be effectively used in combination with diversion dikes.	Common applications for interceptor swales include roadway projects, site development projects with substantial offsite flow impacting the site, and sites with a large area(s) of disturbance. It can be used in conjunction with diversion dikes to intercept flows. Temporary swales can be used throughout the project to direct flows away from staging, storage, and fueling areas along with specific areas of construction. Note that runoff that crosses disturbed areas or is directed into unstabilized swales must be routed into a treatment BMP such as a sediment basin. Grass-lined swales are an effective permanent stabilization technique. The grass effectively filters both sediment and other pollutants while reducing velocity.	• Maximum depth of flow in the swale may be 1.5 ft based on a 2-year design storm peak flow. Positive overflow must be provided to accommodate larger storms. • Side slopes of the swale will be 3:1 or flatter. • Minimum design channel freeboard will be 6 inches. • The minimum required channel stabilization for grades less than 2 percent and velocities less than 6 ft per second (ft/sec) may be grass, erosion control mats, or mulching. For grades in excess of 2 percent or velocities exceeding 6 ft/sec, stabilization in the form of high-velocity erosion control mats, a 3-inch layer of crushed stone, or riprap is required. • Check dams can be used to reduce velocities in steep swales. • Interceptor swales must be designed for flow capacity based on the Manning equation to ensure a proper channel section. Alternate channel sections may be used when properly designed and accepted. • Consideration must be given to the possible impact any swale may have on upstream or downstream conditions. • Swales must maintain positive grade to an acceptable outlet.	Interceptor swales must be stabilized quickly after excavation so they do not contribute to the erosion problem they are addressing. Swales may be unsuitable to the site conditions (too flat or steep). Flow capacity should be limited for temporary swales. Inspection must be made weekly and after each significant ($\geq$0.5 inch) rain event to locate and repair any damage to the channel or clear debris or other obstructions so they do not diminish flow capacity. Damage from storms or normal construction activities, such as tire ruts or disturbance of swale stabilization, should be repaired as soon as practical.

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Control/Description	Primary Use	Application	Design Criteria	Limitations/Maintenance
Diversion Dike/Berm – A compacted soil mound, which redirects runoff to a desired location. The dike/berm is typically stabilized with natural grass for low velocities and stone or erosion control mats for higher velocities.	To intercept offsite flow upstream of the construction area and direct the flow around disturbed soil. It can also be used downstream of the area to direct flow into a sediment reduction device such as a sediment basin or protected inlet. Alternatively, diversion dike/berm can be used to contain flow within the construction site if the water is potentially contaminated. The diversion dike/berm serves the same purpose and, based on the topography of the site, can be used in combination with an interceptor swale.	By intercepting runoff before it has the chance to cause erosion, diversion dikes/berms are very effective in reducing erosion at a reasonable cost. They are applicable to a large variety of projects, including site developments and linear projects such as roadways and pipeline construction. Diversion dikes/berms are normally used as perimeter controls for construction sites with large amounts of offsite flow from neighboring properties. Used in combination with swales, diversion dike/berms can be quickly installed with a minimum of equipment and cost, using the swale excavation as the dike. No sediment removal technique is required if the dike is properly stabilized and runoff is intercepted prior to crossing disturbed areas. Significant savings in structural controls can be realized by using diversion dikes to direct sheet flow to a central area such as a sediment basin or other sediment reduction structure if runoff crosses disturbed areas.	• The maximum contributing drainage area should be 10 acres or less, depending on site conditions. • Maximum depth of flow at the dike will be 1 ft for 2-year design storm. • The maximum width of the flow at the dike will be 20 ft. • Side slopes of the diversion dike will be 3:1 or flatter. • Minimum width of the embankment at the top will be 2 ft. • Minimum embankment height will be 18 inches as measured from the toe of the slope on the upgrade side of the berm. • For velocities less than 6 ft per second, the minimum stabilization for the dike/berm and adjacent flow areas is grass, erosion control mats, or mulch. For velocities greater than 6 ft/sec, stone stabilization or high-velocity erosion control mats should be used. • The dikes will remain in place until disturbed areas protected by the dike/berm are stabilized unless other controls are put into place to protect the disturbed area. • The flow line at the dike will have a positive grade to drain to a controlled outlet.	Compacted earth dikes/berms require stabilization immediately upon placement so they do not contribute to the problem they are addressing. Diversion dikes can be a hindrance to construction equipment moving on the site; therefore, their locations must be carefully planned prior to installation. Dikes/berms must be inspected on a weekly basis and after each significant (> 0.5 inch) rainfall to determine whether silt is building up behind the dike or erosion is occurring on the face of the dike/berm. Silt will be removed in a timely manner. If erosion is occurring on the face of the dike, the slopes of the face will either be stabilized through mulch or seeding, or the slopes of the face will be reduced.

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Control/Description	Primary Use	Application	Design Criteria	Limitations/Maintenance
Silt Fence – Consists of geotextile fabric supported by poultry netting or other backing stretched between wooden or metal posts with the lower edge of the fabric securely embedded in soil. The fence is typically located downstream of disturbed areas to intercept runoff in the form of sheet flow. Silt fences provide both filtration and time for sedimentation and reduce the velocity of runoff. Properly designed silt fences are economical because they can be relocated during construction and reused on other projects.	Normally used as perimeter control downstream of disturbed areas. They are only feasible for nonconcentrated, sheet flow conditions.	Silt fences are an economical means to treat overland, nonconcentrated flows for all types of projects. Silt fences are used as perimeter control devices for both site developments and linear (roadway) type projects. They are most effective with coarse to silty soil types. Due to the potential of clogging, silt fences should not be used with clay soil types. To reduce the length of silt fences, they should be placed adjacent to the downslope side of construction activities.	• Fences are to be constructed along a line of constant elevation (along a contour line) where possible. • Maximum slope adjacent to the fence is 1:1. • Maximum distance of flow to the silt fence should be 200 ft or less. • Maximum concentrated flow to silt fence will be 1 cubic ft per second (cfs) per 20 ft of fence. • If 50 percent or less of soil, by weight, passes the U.S. Standard sieve No. 200, select the equivalent opening size to retain 85 percent of the soil. • Maximum equivalent opening size will be 70 (#70 sieve). • Minimum equivalent opening size will be 100 (#100 sieve). • If 85 percent or more of soil, by weight, passes the U.S. Standard sieve No. 200, silt fences will not be used because of potential clogging. • Sufficient room for the operation of sediment removal equipment will be provided between the silt fence and other obstructions to maintain the fence. • The ends of the fence will be turned upstream to prevent bypass of stormwater.	Minor ponding will likely occur at the upstream side of the silt fence, resulting in minor localized flooding. Fences, constructed in swales or low areas subject to concentrated flow may be overtopped, resulting in failure of the filter fence. Silt fences subject to areas of concentrated flow (waterways with flows > 1 cfs) are not acceptable. Silt fence can interfere with construction operations; therefore, planning access routes onto the site is critical. Silt fences can fail structurally under heavy storm flows, creating maintenance problems and reducing the effectiveness of the system. Inspections should be made on a weekly basis, especially after large storm events. If the fabric becomes clogged, it should be cleaned or, if necessary, replaced. Sediment should be removed when it reaches approximately one-half the height of the fence.

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Control/Description	Primary Use	Application	Design Criteria	Limitations/Maintenance
Straw Bale Dike – A temporary barrier constructed of straw bales anchored with wood posts, used to intercept sediment-laden runoff generated by small disturbed areas. The straw bales can serve as both a filtration device and dam/dike device to treat and redirect flow. Bales can consist of hay or straw, in which straw is defined as best quality straw from wheat, oats, or barley, free of weed and grass seed, and hay is defined as straw that includes weed and grass seed.	A straw bale dike is used to trap sediment-laden storm runoff from small drainage areas with relatively level grades, allowing for reduction of velocity, thereby causing sediment to settle out.	Straw bale dikes are used to treat flow after it leaves a disturbed area on a relatively small (1-acre) site. Due to the limited life of the straw bale, it is cost-effective for small projects of a short duration. The limited weight and strength of the straw bale make it suitable for small, flat (< 2 percent slope) contributing drainage areas. Due to the problems with straw degradation and the lack of uniform quality in straw bales, their use is discouraged except for small applications. Straw bales can also be used as check dams for small watercourses, such as interceptor swales and borrow ditches. Due to the problems in securely anchoring the bales, only small watercourses can effectively use straw bale check dams.	• Straw bale dikes are to be constructed along a line of constant elevation (along a contour line). • Straw bale dikes are suitable only for treating sheet flows across grades of 2 percent or flatter. • Maximum contributing drainage areas will be 0.25 acre per 100 linear ft of dike. • Maximum distance of flow to dike should be 100 ft or less. • Dimensions for individual bales will be 30 inches minimum length, 18 inches minimum height, and 24 inches minimum width, and will weigh no less than 50 pounds when dry. • Each straw bale will be placed into an excavated trench having a depth of 4 inches and a width just wide enough to accommodate the bales themselves. • Straw bales will be installed in such a way that there is no space between bales to prevent seepage. • Individual bales will be held in place by at least two wooden stakes driven a minimum distance of 6 inches below the 4-inch excavated trench to undisturbed ground, with the first stake driven at an angle toward the previously installed bale. • The ends of the dike will be turned upgrade to prevent bypass of stormwater. • Place bales on sides such that bindings are not buried.	Due to a short effective life caused by biological decomposition, straw bales must be replaced after a period of no more than 3 months. During the wet and warm seasons, however, they must be replaced more frequently as is determined by periodic inspections for structural integrity. Straw bale dikes are not recommended for use with concentrated flows of any kind except for small check flows in which they can serve as a check dam. The effectiveness of straw bales in reducing sediment is very limited. Improperly maintained, straw bales can have a negative impact on the water quality of the runoff. Straw bales will be replaced if there are signs of degradation such as straw located downstream from the bales, structural deficiencies due to rotting straw in the bale, or other signs of deterioration. Sediment should be removed from behind the bales when it reaches a height of approximately 6 inches.

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Impacts to surface water from environmental remediation will be monitored through the environmental monitoring program. Monitoring of activities within the IA are conducted through New Source Detection (NSD) and POE monitoring. NSD monitoring provides comprehensive coverage of the entire IA from permanent monitoring locations and focuses on runoff into the two main drainage areas. The NSD objective is to monitor the performance of all remediation activities within the IA with respect to their impact on surface water. POE monitoring allows assessment of RFCA AL adherence. Performance monitoring, as described in the IMP, may be implemented if a project poses a concern for contaminant release. Monitoring activities will target the contaminants of greatest concern for the action being monitored.

6.3 GROUNDWATER

Several groundwater contaminant plumes were identified during previous RFI/RIs and sitewide programs. Groundwater wells, installed to monitor plume extent, are being sampled as part of the routine groundwater monitoring program. When active groundwater wells are located in IHSSs, PACs, UBC sites, or areas being remediated, compliance staff may direct or perform groundwater sampling. Performance monitoring, as described in the IMP may be implemented if a project poses a concern for contaminant release. Monitoring locations will target the contaminants of greatest concern for the action being monitored.

6.4 ECOLOGY

Environmental remediation under this RSOP may affect ecological resources. Wetlands exist in some portions of the Site, and environmental remediation activities that could impact wetlands must be reviewed prior to initiating an action. Downgradient wildlife habitat could also be damaged if soil or other eroded materials are allowed to flow into the habitats. Measures to prevent siltation, as described in Section 6.2, will be used. To minimize the possibility of adverse effects and ensure regulatory compliance is met, surveys of potential remediation sites by Site ecologists will be conducted prior to any environmental remediation activities. Animal habitats may be temporarily impacted by the environmental remediation; however, the effects will be eliminated once native vegetation is restored. If soil is left exposed for an extended period of time, additional control measures may be necessary.

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7.0 WORKER HEALTH AND SAFETY

Remediation activities could expose workers to physical, chemical, biological, and low levels of radiological hazards. Physical hazards include those associated with excavation activities, drilling, use of heavy equipment, noise, heat stress, cold stress, and work on uneven surfaces. Physical hazards will be mitigated by appropriate use of engineering and administrative controls and personal protective equipment (PPE). Chemical hazards will be mitigated by use of PPE and administrative controls. Appropriate skin and respiratory PPE will be worn throughout the project.

Because of the anticipated contaminants, remediation activities in accordance with DOE Order 440.1A, are required to follow the Occupational Safety and Health Act (OSHA) construction standard for *Hazardous Waste Operations and Emergency Response*, 29 CFR 1926.65. In accordance with this standard, H&S specifications will address the safety and health hazards of each phase of the project and specify the requirements and procedures for employee protection. In addition, the DOE Order for *Construction Project Safety and Health Management*, 5480.9A, applies to these projects. This order requires the preparation of JHAs to identify each task, hazards associated with each task, and cautions necessary to mitigate the hazards. These requirements will be integrated into the HASP wherever appropriate.

A HASP Addendum and JHA will be prepared on an IHSS Group-specific basis to identify and control potential hazards. The HASP Addendum will address both the specific hazards to be encountered and applicable guidance and requirements (e.g., OSHA), as well as specific safety equipment (e.g., hard hats and PPE) required for individual tasks. Implementation of the requirements of these documents will minimize the possibility and potential consequences of accidents and minimize physical hazards. Specific items to be covered in the HASP or HASP Addenda include the following, as applicable:

- Scope of work;
- Personnel responsibilities;
- Site information;
- Description of project-specific tasks;
- Project orientation and training requirements, including medical surveillance, required meetings, and reporting, logbook, and visitor procedures;
- Training requirements;
- PPE requirements;
- Monitoring requirements;
- Hazard assessment of biological, physical, chemical, and radiological hazards;
- Fire protection plans;

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- Site access control and work zones;
- HASP bulletin board requirements;
- Sanitation requirements;
- Emergency response procedures, plans, and telephone numbers;
- Spill control procedures; and
- Record keeping requirements.

JHAs address specific hazards associated with remediation activities, including hazards for each task step, controls to be used, special equipment requirements, training, and any necessary monitoring. No field work will be performed until a JHA has been written and approved with the exception of walkdowns, general work tasks, surveillance, inspections, and other tasks specified by the project-specific H&S Officer. The project H&S Officer, with radiological personnel, will assess the need for personnel and area monitoring.

Work activities will be stopped if any hazard is encountered or a known or potential hazard is present at a level exceeding established control limits, and appropriate notifications and mitigation of the hazard encountered will be pursued.

H&S data and controls will be continually evaluated. Field radiological screening will be conducted using radiological instruments appropriate to detect surface contamination and airborne radioactivity. As required by 10 CFR 835, *Radiation Protection of Occupational Workers*, all applicable implementing procedures will be followed to ensure protection of workers.

Potential threats to H&S for collocated workers and the general public from the release of airborne materials will be mitigated via implementation of dust suppression techniques, as described in Section 6.1. Use of controls and procedures for worker protection will also protect the public, because work control measures are designed to identify potential hazards and prevent releases (e.g., by using dust controls).

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8.0 WORK CONTROLS

Because the complexity of remediation projects will vary, project hold-points and criteria to accommodate varying conditions are routinely used at RFETS to prevent impacts to worker safety and the environment. Field conditions such as differences in contaminant levels and presence of debris or pipelines may be encountered during remediation activities. Field conditions requiring work controls include incidental water, debris, or unknown utilities; elevated contamination in soil or air; and incidental spills. Emergency response, accidents, injuries, and natural disasters are described in the project-specific work controls.

Field conditions will be evaluated to determine their significance, and whether project work controls are sufficient to address specific field conditions. Based on this initial evaluation, a determination will be made whether to proceed with controls currently in place; isolate the field condition from the project activity, if it can be done safely; or pause operations to address the field condition. If a project pause is required, a revised JHA and work control documents will be prepared. After the revised JHA has been approved, work will proceed according to the appropriate control measures. Data and controls will be continually evaluated during project execution. Work controls ensure all work is performed based on an informed approach with regards to all potential hazards. The following sections describe field conditions and the corresponding response actions.

8.1 INCIDENTAL WATER

Considering the shallow bedrock, groundwater conditions, and the possible depth of contamination at the Site, excavations may accumulate incidental water during remediation. If incidental water is encountered, it will be sampled and managed in accordance with the Site's Incidental Water Procedure (1-C91-EPR-SW.01, *The Control and Disposition of Incidental Water*). Incidental water is defined as precipitation, surface water, groundwater, utility water, process water, or wastewater collected in one or more of the following areas:

- Excavation sites, pits, or trenches;
- Secondary containments or berms;
- Valve vaults;
- Electrical vaults;
- Steam pits and other utility pits;
- Utility manholes;
- Other natural or manmade depressions that must be dewatered; or
- Discharges from a fire suppression system that has been breached within a radiological buffer area or a contamination area.

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Incidental water may be sampled to determine whether it may be discharged to the environment or treatment is required. Options for water disposition may include treatment or direct discharge depending on contaminant levels in the water. Process knowledge, field pH, appearance, field nitrate, and field conductivity are the initial screening criteria. Additional sampling and analysis may be conducted when known or suspected contamination is present. These additional samples may be evaluated for gross alpha, gross beta, pH, VOCs, and metals.

Incidental water encountered as a result of stormwater or groundwater entering and collecting in an excavation will be removed if sufficient volume is present. Using a field sump, the water will be transferred to an incidental water holding tank adjacent to the area. This holding tank will be constructed with sufficient secondary containment and labeled appropriately. If the incidental water contains contaminant concentrations equal to or greater than the RFCA Surface Water Standards for Segment 5, the incidental water will be sent to an available onsite treatment facility, or will be disposed offsite.

8.2 UNEXPECTED DEBRIS

Historical data indicate unexpected debris will be encountered during remediation activities. When drums, wood, metal, plastic, rubber, fiberglass, or other debris is found during excavation activities, the following actions will be taken:

- Excavation activities will be immediately suspended and the Project Manager, Field Supervisor, Project H&S Officer, Project Environmental Manager, and Radiological Safety will be notified.

- Information regarding the debris will be gathered. This will include any labels, markings, or other visual clues as to the nature of the debris.

- Upon approval from the Project Manager or Field Supervisor, as well as the Radiological Safety Section Manager/Radiological Control Technician (RCT) Supervisor and H&S Officer, the debris will be removed from the excavation and placed on plastic sheeting where it can be surveyed for radiological contamination in accordance with 3-PRO-165-RSP-07.02, "*Contamination Monitoring Requirements*", monitored for VOCs, and further characterized as necessary.

- After characterization, the debris will be appropriately segregated and staged for disposal.

- Based on the radiological survey, VOC monitoring results, and other characterization data, the area radiological postings, RWP, controls, and work practices will be reviewed and modified as necessary.

- Upon approval from the K-H Project Manager, excavation activities will resume.

8.3 UNKNOWN UTILITIES

Some utilities installed at RFETS are not shown on existing utility drawings. When encountered during excavation work, these cannot always be readily identified by type and may create

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potential hazards to workers. The process for dispositioning utilities that are not adequately identified is as follows:

- Suspend all excavation activities and notify the Project Manager, Field Supervisor, Project H&S Officer, Project Environmental Manager, and Site Excavation Specialists.
- Review all utility drawings and contact knowledgeable building personnel to identify the possible range of utilities.
- Trace lines with all available equipment and excavate where feasible.
- Develop a work-around for the unknown utility, if possible.
- Ensure worker safety by protecting the utility from damage.
- Use infrared, radiography and other nonintrusive techniques to obtain additional information on the utility type and conduit contents. Infrared scanning devices are used by the RFETS Fire Department to determine the presence and level of liquid in pipes. The Rocky Flats Bomb Squad identifies the types of utilities in plastic and metal conduits using a portable x-ray device.
- Mark tested locations and identified features on the conduit.
- Use tap and drain techniques where appropriate to collect a sample of contained fluids for analysis if the conduit contains liquid. The sample results will determine the appropriate controls needed to breach the line.
- Make a small opening on the side of the conduit away from the wires to allow additional testing if the conduit contains wires but not liquids and if the wires can be adequately located.
- Determine the possible hazards and hazard controls after the utility is better identified.
- Develop a specific project work package, including a JHA, or revise the existing package and JHA if the utility must be breached.
- Minimize potential for spills. If possible, orient pipe to reduce the volume in the area that will be broken if liquids are suspected to be present.
- Notify shift supervisor prior to cutting the utility.
- Upon approval from the K-H Project Manager, excavation activities will resume.

8.4 SOIL SURFACE FIDLER READINGS GREATER THAN 5,000 COUNTS PER MINUTE

Field Instrument for the Detection of Low Energy Radiation (FIDLER) readings will be taken on the surface of soil removed from an excavation. If levels greater than 5,000 counts per minute (cpm) are detected, the following actions will be taken:

- Excavation activities will be immediately suspended and the Project Manager or Field Supervisor, Project H&S Officer, Project Environmental Manager, and Radiological Safety will be notified.

- A plastic-lined and -covered soil segregation area will be established at the excavation site for soil above 5,000 cpm.

- Based on the FIDLER readings, the area radiological postings, RWP, controls, and work practices will be reviewed and modified as necessary.

- Upon approval from the K-H Project Manager or their designee, excavation activities will resume.

- A composite sample of the segregated soil will be analyzed using a high-purity germanium (HPGe) detector. Based on the sample results, the area radiological postings, RWP, controls, and work practices will be reviewed and modified as necessary.

- Upon approval from the K-H Project Manager or their designee, the segregated soil will be managed, as appropriate. Until soil is removed from the site, the segregated soil will be covered at the end of each day.

8.5 PROJECT PERIMETER RADIOLOGICAL AIR SAMPLE RESULTS GREATER THAN 10 PERCENT DERIVED AIR CONCENTRATION

To protect collocated workers in the Contaminant Reduction Zone/Radiological Buffer Zone (CRZ/RBZ) and project support zone, project perimeter, or work area high- and low-volume air samples will be collected. A portable alpha analyzer will be used to determine whether an elevated sample result is due to naturally occurring radioactive material or radioactive COCs. If a confirmed sampling result is greater than 10 percent of the Derived Air Concentration (DAC), the following actions will be taken:

- All activities will be immediately suspended, and the Project Manager or Field Supervisor, Project H&S Officer, Project Environmental Manager, and Radiological Safety will be notified.

- Access to downwind areas will be restricted.

- All personnel in the CRZ/RBZ and support zone will be moved to a safe upwind assembly area.

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- Based on sample and monitoring results, potential personal radiological exposures will be reviewed.
- Based on the sample results, the area radiological postings, RWP, controls, and work practices will be reviewed and modified as necessary.
- Upon approval from the K-H Project Manager or their designee, work activities will resume.

8.6 EQUIPMENT RADIOLOGICAL CONTAMINATION GREATER THAN TRANSURANIC RELEASE LIMITS

All material and equipment exiting a radiological control area at the excavation will be surveyed. In the event that survey results indicate contamination levels greater than unrestricted release limits, the following actions will be taken:

- All activities will be immediately suspended, and the Project Manager, Field Supervisor, Project H&S Officer, Project Environmental Manager, and Radiological Safety will be notified.
- The source of the contamination will be identified and controlled.
- The contaminated material or equipment will be contained, handled, and transferred in accordance with the RFETS Radiological Control Manual.
- Based on the survey results, the area radiological postings, RWP, controls, and work practices will be reviewed and modified as necessary.
- Upon approval from the K-H Project Manager or their designee, work activities will resume.

8.7 PROJECT PERIMETER VOLATILE ORGANIC COMPOUND MONITORING GREATER THAN BACKGROUND

To protect collocated workers in the CRZ/RBZ and project support zone, perimeter VOC air monitoring will be conducted. If results indicate the sustained presence of VOCs at levels greater than background, the following actions will be taken:

- All activities will be immediately suspended, and the Project Manager, Field Supervisor, Project Environmental Manager, and Project H&S Officer will be notified.
- All personnel in the CRZ/RBZ and support zone will be moved to a safe upwind location.
- Based on monitoring results, potential personal chemical exposures will be reviewed.
- Based on monitoring results, site control and work practices will be reviewed and modified.
- Upon approval from the K-H Project Manager or their designee, work activities will resume.

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8.8 HAZARDOUS SUBSTANCE RELEASE

The Site Spill Response Plan is designed to establish a program to optimize a safe response to incidental and emergency situations with the intent of protecting project personnel, collocated workers, the public, the environment, and property in the event of spills, fire, or explosion. All spills will be addressed in accordance with the Emergency Response and Spill Control Program. If applicable, reporting will be conducted in accordance with Administrative Procedures Manual, 1-D97-ADM-16.01, *Occurrence Reporting Process*, the Chemical Management Manual, and regulatory reporting requirements.

8.8.1 Incidental Spills

Incidental spills are those where the substance can be safely absorbed, neutralized, or otherwise controlled by employees in the immediate release area at the time of the release. In addition, the release does not have the potential to become an emergency within a short time frame.

Spills considered incidental include the following:

- Gasoline, diesel, or hydraulic oil spills;
- Contaminated soil spills outside the Exclusion Zone/Soil Containment Area (EZ/SCA); and
- Decontamination or incidental water spills inside secondary containments.

Criteria that must be met prior to incidental release response actions at the project site include:

- The Project Manager, Field Supervisor, Project Environmental Manager, and Project H&S Officer must be notified, and Radiological Safety must be notified as well if spill involves radiological material.
- Chemical hazards of the substance spilled are known and quantified.
- Standard PPE will provide adequate personal protection.
- Decontamination methods are suitable for the substance spilled.
- All materials or equipment used during the response are compatible with the substance spilled.

Post-incidental spill response includes:

- Ensuring proper reporting in accordance with HSP-21.04, ADM-16.01 and the Chemical Management Manual; and
- Conducting a briefing to address the cause of the spill, methods of preventing future spills, and ways to improve readiness and response.

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9.0 WASTE MANAGEMENT

This section describes the management of contaminated soil and debris remediation waste, as well as wastewater that may be generated during remediation. Soil and debris remediation waste will be disposed offsite with or without prior treatment or may be used onsite if treated soil meets backfill criteria (DOE 2001c). Wastewater will be contained, characterized, and treated as necessary. All waste will be managed in accordance with RFETS policies and procedures, as well as substantive ARARs.

9.1 WASTE TYPES

Potential remediation waste types include nonroutine sanitary, LL, TRU, hazardous, LLM and TRU mixed waste, PCB and low-level PCB wastes, and friable asbestos-containing material (ACM) and LL ACM wastes.

9.1.1 Soil and Debris

During remediation, contaminated soil and debris will be excavated, and characterized and managed appropriately for the type of waste it represents based on its chemical, physical, and radiological constituents.

Nonroutine Sanitary Waste

Uncontaminated debris, including non-friable asbestos, generated during remediation activities is managed as nonroutine sanitary waste. Radiological Engineering will perform a waste release evaluation (WRE) in accordance with PRO-141-RSP-09.01, *Unrestricted Release of Property, Material, Equipment, and Waste* to ensure the waste meets unrestricted release limits.

Low-Level Waste and Low-Level Mixed Waste

LL waste is defined as radioactive waste that is not classified as high-level waste, TRU waste, spent nuclear fuel, or by-product material as defined by DOE Order 435.1, *Radioactive Waste Management*. The activity of radionuclides in LL waste is less than 100 nanocuries/gram (nCi/g), with no specific minimum level of activity. LL mixed waste is LL waste that also contains RCRA hazardous constituents.

TRU Waste and TRU Mixed Waste

TRU waste is radioactive waste that is not defined as high-level waste and contains alpha-emitting transuranic radionuclides with atomic numbers greater than 92 and half-lives greater than 20 years with activities greater than 100 nCi/g. TRU mixed waste is TRU waste that also contains RCRA hazardous waste.

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Hazardous Waste

Excavated soil and debris will be characterized in accordance with regulatory requirements (40 CFR 261 and 6 CCR 1007-3, Part 261). Soil and debris that is characterized as RCRA hazardous contains a hazardous waste listed in Subpart D of Part 261 or exhibits a characteristic of hazardous waste as defined in Subpart C of Part 261.

A hazardous waste cannot be radiologically contaminated (or it is considered mixed waste). Soil will require radiological characterization in accordance with 3-PRO-140-RSP-09.03, *Unrestricted Release of Bulk or Volume Material.* Debris will be characterized in accordance with 3-PRO-141-RSP-09.01 and must meet the unrestricted release limits.

PCB and Low-Level PCB Waste

Soil and debris containing PCBs as a result of a spill, release, or other unauthorized disposal may be PCB remediation waste as defined by TSCA and the promulgated regulations in 40 CFR 761. The waste may be classified as LL PCB or TRU PCB remediation waste, depending on the types and activities of radionuclides present. PCB remediation waste may also be contaminated with RCRA constituents.

Friable Asbestos-Containing Material

Friable ACM is any material that contains more than 1 percent asbestos and, when dry, may be crumbled, pulverized, or reduced to a powder by hand pressure. The RFETS Industrial Hygiene organization is responsible for making friability determinations for ACM. As with PCB remediation waste, ACM may be LL or TRU, depending on the types and activities of radionuclides present.

9.1.2 Wastewater

Wastewater may be generated by dewatering groundwater and surface water accumulation in excavations or detention ponds. The wastewater could contain hazardous constituents and/or radionuclides.

9.2 ONSITE MANAGEMENT AND TREATMENT

Soil and debris remediation waste will be placed into rolloffs or other waste containers to prevent erosion and runoff. Alternatively, remediation waste may be stockpiled in the project area in a covered, bermed area, as necessary. Remediation waste will be stored in the project area until the waste is treated onsite or transferred from the project area to a K-H approved offsite treatment or disposal facility or to an interim storage area prior to offsite shipment. Remediation waste will be managed onsite in accordance with substantive ARARS (Section 4.3).

9.2.1 Waste Storage Requirements

Hazardous remediation waste will be managed in accordance with the requirements of 6 CCR 1007-3, Part 264, Subpart I, *Use and Management of Containers*, or stockpiled to ensure the safe and appropriate management of this type of waste. Waste handling and storage during

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remediation will meet the substantive requirements of 6 CCR 1007-3, 264.553 and 6 CCR 1007-3, Part 264, Subpart I. Storage of PCB remediation waste will meet the applicable, substantive requirements of 40 CFR Part 761.

9.2.2 Waste Treatment Requirements

Contaminated soil may be treated onsite using low-temperature thermal desorption if the treated waste is expected to meet criteria for onsite backfill. In this instance the treatment unit will be established as a miscellaneous unit, managed pursuant to the substantive requirements of 6 CCR 1007-3, Part 264, Subpart X. Environmental evaluations required by Subpart X status, such as surface soil, geology, and hydrology, are contained in previously prepared RFI/RI reports. Operation of a miscellaneous unit will be conducted in accordance with the substantive requirements of 6 CCR 1007-3, Part 264, Subparts AA and BB, Air Emissions Standards for Process Vents and Air Emissions Standards for Equipment Leaks. The substantive requirements of 6 CCR 1007-3, Part 265, Subpart P, *Thermal Treatment*, will be incorporated to provide operating parameters appropriate for treatment using thermal desorption technology.

9.3 OFFSITE TREATMENT OR DISPOSAL

Remediation waste generated at RFETS and destined for offsite treatment or disposal will be managed onsite in accordance with substantive ARARS (Section 4.3). This includes nonroutine sanitary wastes (e.g., trash and debris suitable for disposal in a sanitary landfill). The overall waste characterization, generation, and packaging process for the waste is specified in the *Low-Level/Low-Level Mixed Waste Management Plan,* 94-RWP/EWQA-0014. The waste classification of contaminated soil and debris will determine the type of disposal site and type of treatment (if any) required.

Nonroutine Sanitary Waste

Nonroutine sanitary waste will be disposed in K-H approved sanitary landfills. Nonroutine sanitary waste will be characterized and managed in accordance with 1-PRO-573-SWODP, *Sanitary Waste Offsite Disposal Procedure*. Critical to characterization is the WRE, indicating the waste meets RFETS unrestricted release limits. The waste must also be free of prohibited items as defined by receiver site requirements.

Low-Level Waste

LL waste will be treated and/or disposed at a K-H approved LL waste disposal facility. Excavated soil from each project area will be collected and analyzed to demonstrate it is LL and does not contain hazardous waste. Debris with surface contamination will be characterized as surface-contaminated objects (SCO) in accordance with PRO-267-RSP-09.05, *Radiological Characterization for Surface Contaminated Objects*. The SCO characterization is required to demonstrate compliance with DOT regulations in 49 CFR 173 and regulatory requirements.

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TRU Waste

TRU waste will be disposed at the Waste Isolation Pilot Plant (WIPP). Chemical characterization (chemical analysis or process knowledge) of TRU waste is required. TRU waste will be packaged in accordance with TRUCON codes, which were developed to meet the TRUPACT-II transportation requirements. The TRUCON codes specify the radionuclide activity loading limits (otherwise known as wattage limits) for a given waste Item Description Code (IDC) and packaging configuration (type and number of layers of confinement).

Hazardous, Low-Level Mixed, and TRU Mixed Wastes

Excavated soil that contains hazardous listed waste or exhibits hazardous characteristics must meet the LDR requirements of 6 CCR 1007-3, Part 268 prior to disposal. Soil with hazardous constituent concentrations 10 times the Universal Treatment Standards (6 CCR 1007-3, Part 268.48) will be treated to achieve these standards, or to achieve 90 percent reduction in total hazardous constituent concentrations (or 90 percent reduction in extractable concentrations for metals) prior to disposal, whichever is least restrictive (6 CCR 1007-3, Part 268.49[c] and [d]). Treated soil that no longer contains listed waste or exhibits characteristics of hazardous waste can be disposed as nonhazardous waste or used as backfill (Section 5.12). Otherwise, the soil will be disposed in a K-H approved hazardous waste disposal facility. Debris that is a characteristic hazardous waste will require treatment prior to land disposal (6 CCR 1007-3, Part 268.45).

The disposition of LLM remediation waste will depend on the waste characteristics. Currently for direct disposal, characterization must show that the waste is solid, LDR compliant, and contains radionuclides at less than 100 nCi/g activity. Samples of the excavated soil from each project area will be collected and analyzed. LLM remediation waste will be stabilized or treated offsite as necessary and disposed in a K-H approved disposal facility. Currently, a waste disposal site does not exist for mixed wastes with radionuclide activities between 10 and 100 nCi/g.

Beryllium Waste

Process knowledge will be used to identify debris that may be contaminated with beryllium. Beryllium remediation waste will be managed in accordance with 10 CFR 850. Debris contaminated with beryllium greater than 0.2μg/100 cm^2 will be disposed offsite at a K-H approved facility. Generator knowledge or analytical data will be used to identify soil contaminated with beryllium. Soil with beryllium values above RFCA ALs, as determined by analysis, will be disposed at a K-H approved disposal facility.

PCB Waste

Nonradiological PCB remediation waste with PCB concentrations less than 50 ppm will be disposed in a sanitary landfill in accordance with 40 CFR 761.61(a)(5)(i)(B)(2)(ii). PCB remediation waste with PCB concentrations equal to or greater than 50 ppm will be disposed at a RCRA Subtitle C facility or TSCA-permitted disposal site in accordance with 40 CFR 761.61(a)(5)(i)(B)(2)(iii). LL and TRU remediation waste with PCBs will be disposed offsite at an approved facility.

Friable Asbestos

Friable asbestos will be managed in accordance with OSHA (29 CFR 1910.1001 and 29 CFR 1926.1101), NESHAPS (40 CFR 61 Subpart M), and 40 CFR 763, *Asbestos.* In general, friable ACM will be wetted and packaged in a plastic bag not less than 6 mils in thickness, a combination of plastic bags equal to at least 6 mils in thickness, or a container lined with plastic of not less than 6 mils in thickness. Friable asbestos, LL friable asbestos, and TRU friable asbestos will be disposed at K-H approved facilities. Nonfriable, nonradioactively-contaminated ACM can be managed as nonroutine sanitary waste.

9.3.1 Wastewater Management

Remediation wastewater will largely consist of infiltrated groundwater and incident precipitation accumulation within excavations. Accumulated water that is removed will be managed in accordance with 1-C91-EPR-SW.01, *Control and Disposition of Incidental Waters.* This procedure includes instructions for the proper characterization, transfer, treatment, and discharge of the water. The project will identify the treatment and disposal process to be used for the wastewater. Contaminated water from pipeline flushing will be treated onsite if appropriate facilities are available or will be disposed offsite at K-H approved facility.

9.4 WASTE MINIMIZATION AND RECYCLING

Waste minimization and recycling will be integrated into the planning and management of materials generated during remediation. Unnecessary generation of wastes will be controlled using work techniques that prevent the contamination of areas and equipment, preventing unnecessary packaging, tools, and equipment from entering contaminated areas, and reusing contaminated tools and equipment, when practical.

Standard operations and processes will be evaluated for waste minimization, and suitable minimization techniques will be implemented. Property with radiological or chemical contamination may be reused or recycled on site, offsite by other DOE facilities, or by publicly or privately owned facilities having proper authorization to take possession of the property. Recycling options that may be considered for materials generated during remediation are listed in Table 7. Materials will be recycled based on availability of appropriate recycle technologies, availability of facilities, and cost effectiveness.

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Table 7
Recycling Options

Material	Recycle Option	Comments
"Clean" scrap metal (not radioactively contaminated and not considered hazardous in accordance with RCRA)	Recycle through approved scrap metal vendors or via contract.	Material must meet receiving facility's requirements and licensing requirements, if any.
Nonradioactive scrap metal contaminated with beryllium	Recycle through approved commercial facility.	Post-decontamination concentrations will be < 0.2 $\mu g/100\ cm^2$
Concrete rubble meeting the unrestricted release criteria	Reuse onsite as backfill.	Must meet release criteria established in the RSOP for Recycling Concrete.
Wring and other electrical components meeting the unrestricted release criteria	Recycle through approved commercial recycling facility.	Material must not exceed contamination types and levels identified in the receiving facility's requirements and license.
Bulk plastics and glass meeting the unrestricted release criteria	Recycle through approved commercial recycling facility.	Material must not exceed contamination types and levels identified in the receiving facility's requirements and license.

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10.0 QUALITY ASSURANCE

QA requirements relevant to this RSOP are consistent with quality requirements as defined in DOE (Order 414.1A, *Quality Assurance*) and EPA (QA/R-5, EPA *Requirements for Quality Assurance Project Plans for Environmental Data Operations*, 1997). These requirements are also consistent with RFETS-specific quality requirements as described in the Kaiser-Hill Team *Quality Assurance Program*, PADC-1996-00051 (K-H 1999). Activities controlled by this RSOP are not covered under 10 CFR 830.120 (QA) unless inventories of materials, under direct control of the project, become nuclear facilities as defined in DOE Standard 1027-92. Hazardous and radiological risks to project personnel are addressed in the project's HASP or HASP Addendum. The applicable QC categories include the following:

Management

Quality Program;

Training;

Quality Improvement; and

Documents/Records.

Performance

Work Processes;

Design;

Procurement; and

Inspection/Acceptance Testing.

Assessments

Management Assessments; and

Independent Assessments.

The ER Program Quality Assurance Project Plan (QAPjP) will discuss in detail how these criteria will be implemented. The project manager will be in direct contact with the QA manager to identify and correct potential quality-affecting issues. Oversight of field activities will be conducted to ensure compliance with quality requirements.

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11.0 DECISION MANAGEMENT

A variety of data types will be generated during remediation to support data analysis and reporting requirements. ER will manage analytical data so the staff can evaluate these data on a daily basis. Field analytical data will be transferred to ASD for archiving. All offsite analytical data will be managed by ASD.

Data generated during characterization and remediation will include, but not be limited to, the following:

- Sampling location data;
- Field parameters (depth, sample interval, field instrument readings, etc); and
- Surface and subsurface soil analytical data.

Data collected during these activities will meet RFETS data quality requirements and project DQOs. Characterization and remediation data will be used for the following purposes:

- Document Site characterization and remediation activities and decisions;
- Provide final characterization of all residual materials;
- Provide data for the CRA; and
- Support the CAD/ROD and post-closure monitoring.

The data systems used to support characterization and remediation are in common RFETS standard platforms to facilitate integration of data and information among media, and make data easily available to users.

11.1 ENVIRONMENTAL RESTORATION REMEDIAL ACTION DECISION MANAGEMENT SYSTEM

The ER Remedial Action Decision Management System (RADMS) is used to generates, verify, validate, and produce maps and reports. The ER RADMS is used to access and evaluate environmental data, produced within 24 to 48 hours of sample collection and analysis, during both characterization and remediation activities. Figure 20 illustrates the general data flow and system configuration.

Field and analytical data is organized in Microsoft Access and linked with a GIS, specifically ArcView, to provide users with contaminant data by geographic location and the ability to perform spatial analyses. The ER RADMS will interface with existing site databases, including ASD and SWD, to ensure data consistency and retrievability.

The ER staff will use the RADMS to:

- Evaluate analytical data;
- Track environmental samples/maintain chain-of-custody;
- Assess the quality of analytical results;
- Determine characterization sampling locations;
- Determine remediation areas;
- Determine confirmation sample locations;
- Estimate risks from residual contamination;
- Track closure of RCRA units;
- Track ER waste volumes and composition; and
- Produce maps and reports.

Additionally, the RADMS will be available to CDPHE and EPA. ER staff will work interactively with the regulatory agencies to:

- View existing data;
- Develop proposed characterization sampling locations;
- Determine remediation areas;
- Determine confirmation sample locations; and,
- Accelerate the review and approval process by working with virtual data and graphics prior to submittal of Closeout Reports.

The RADMS includes several modules customized for ER program decision making. These modules include the following:

- Sample Tracking;
- Data Analysis;
  - Spatial analysis,
  - Risk screen, and
  - Data verification and validation,

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- RCRA Closure;
- Waste Management; and
- Automated Reporting.

11.1.1 Sample Tracking

All characterization and remediation samples will be tracked through the RADMS data collection management module. Sample tracking will be keyed to the ASD sample numbering system and will include a variety of field parameters (e.g., those currently required by ASD), as well as sample depth, test method, collection time, field QC information, etc. Chain-of-custody forms and sample labels will be printed from this module.

11.1.2 Data Analysis

Data will be analyzed through several different modules, as described below. Routine statistical, verification and validation, and spatial analysis (through graphics) will be automated. The algorithms and data analysis sequences are consistent with project DQOs. Data analysis will be performed with verified and validated data after characterization sampling is complete, and again, after remediation confirmation sampling.

Verification and Validation

All data collected during ER characterization and remediation sampling will be verified and validated in accordance with the IASAP (DOE 2001a), BZSAP (DOE 2001b), and QA requirements. Verification will consist of ensuring all data received from the analytical vendor(s) are complete and correctly formatted. Validation will consist of a systematic comparison of all QC requirements with results reported by the vendor (e.g., relative to laboratory control samples, matrix-spikes, matrix spike duplicates, and blanks). The verification and validation process will establish usability of the data by determining, reporting, and archiving the following criteria relative to each measurement set or batch:

- Precision;
- Accuracy;
- Bias;
- Sensitivity; and,
- Completeness.

Spatial Analysis

Several data aggregation and evaluation options are available in the spatial analysis module, including inverse distance weighting (IDW), kriging, Monte Carlo simulations, and other

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geostatistical techniques. Spatial analysis will allow determination of contaminant concentration boundaries as defined by RFCA Tier I, Tier II, agreed upon cleanup levels, and background values. This analysis will also be used to determine additional sampling locations, remediation areas, and associated confidences in the values and decisions.

Risk Screen

The risk screening module is used to estimate whether human health risks are acceptable in remediated areas. Algorithms in the risk screening module are consistent with DQOs in the Draft Comprehensive Risk Assessment (CRA) Methodology (DOE 2000f), IASAP (DOE 2001a), and Draft BZSAP (DOE 2001b). The risk screening module includes estimation of external and internal exposures on an IHSS Group basis.

11.1.3 RCRA Closure

The RCRA closure module allows a user to archive all pertinent location, analytical, and remediation information about RCRA units. This will be used to track closure of sections of the NPWL and other RCRA units closed by ER.

11.1.4 Waste Management

Location, volume, characteristics, classification, and container type will be tracked for all ER remediation waste. ER waste data will be transferred to the Site WEMS database.

11.1.5 Reporting

The RDMS is configured to produce reports from all of the customized modules. Hardcopy reports will typically consist of data tables (queries), isopleth maps (e.g., Tier I, Tier II, agreed upon cleanup levels, and background concentration boundaries), and combinations of tables and maps tailored to specific needs. Hardcopy reports will be minimized through the routine use of desktop "workstations" dedicated to specific locations and/or personnel within the project, DOE, EPA, and CDPHE.

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12.0 ENVIRONMENTAL CONSEQUENCES

Paragraph 95 of RFCA mandates incorporation of National Environmental Policy Act (NEPA) values into RFETS decision documents. This section of the RSOP addresses the environmental consequences from ER soil remedial actions, including the remediation, treatment, and disposition of contaminated soil and debris, importing clean soils for backfilling excavations, and related actions. The section therefore satisfies the RFCA requirement for a "NEPA-equivalency" assessment of environmental consequences.

Emphasis in this section is on analyzing short-term impacts associated with remediation activities, and distinguishing them from long-term impacts associated with RFETS closure, including the final configuration. The analysis incorporates several previously completed documents and generally accepted assumptions to evaluate impacts in specific resource areas. Offsite transportation impacts, from implementing offsite treatment and disposal alternatives, are addressed previously in Attachment 3 to the RSOP for Facility Disposition (DOE 2000b) (for LL and LLM waste), and in the Draft 2000 Cumulative Impacts Document (CID) Update Report (Draft CID Update) (Labat-Anderson [L-A] 2000). Offsite facilities considered for waste treatment or disposal of RFETS waste (e.g., LL, LLM, and nonradiological waste) are assumed to be in operation, to be properly licensed and permitted to provide such services, and have sufficient capacity to handle RFETS waste. In the case of another DOE facility (e.g., Nevada Test Site [NTS]), the facility is assumed to already have NEPA documentation that addresses treatment and disposal of waste from other DOE sites, including RFETS. Specific locations of local offsite treatment and soil/borrow facilities to be used for remediation activities have not yet been identified.

The remediation impact analysis relies heavily on conclusions reached in the CID (DOE 1997d) and Draft CID Update (L-A 2000), both of which focus on cumulative impacts resulting from onsite activities implemented through RFETS closure. In summary, remediation activities will result in adverse short-term impacts in many resource areas, including air quality, water quality, traffic congestion, and ecological resources. In many instances, the impacts could be intense for a short period of time. However, the impacts are temporary and controllable with mitigation (e.g., monitoring, BMPs). The long-term impacts of soil remediation are minor, and the benefits of removing contamination from RFETS far outweigh these impacts.

To ensure a thorough environmental compliance review of actions that will fall within the scope of the ER RSOP, an environmental review of ER RSOP actions will be conducted. Review of the action will ensure adequate consideration of environmental concerns.

12.1 SOIL AND GEOLOGY

The remediation of a substantial amount of contaminated soil will result in a long-term beneficial impact. However, in the short-term, remediation activities may require significant excavation and soil stockpiling. Potentially adverse impacts include soil disturbance, soil erosion, and subsidence (slumping). In addition, alternatives requiring offsite treatment or disposal of soil may result in substantial soil losses from RFETS.

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Subsurface geology is not likely to be affected by remediation activities. Activities will result in limited disturbance of the subsurface, which will, in particular, occur during remediation of OPWL and NPWL areas. These areas have generally been previously disturbed and do not contain mineral resources.

Surface soils have been mixed, compacted, and otherwise disturbed throughout the IA. While ongoing activities will further disturb soil throughout RFETS, most activities will occur in developed areas and will affect previously disturbed soils. However, remediation of some IHSS areas will occur in the BZ.

Remediation will involve the removal of contaminated soil and backfilling excavations. To minimize further contamination of surface soils during remediation activities, the contaminated soil being removed will either be put in rolloff containers and remain at that location, or be moved to a new location for temporary storage or treatment, as appropriate, prior to final disposition. The new locations may be onsite or offsite, depending on the treatment alternative selected, and will be set aside for soil with similar concentrations of the same types of constituents. Contaminated soil will not be distributed to undisturbed or "clean" areas.

Soil disturbance may result in siltation due to the large volumes of soil being moved and dispositioned. Exposed areas, especially soil found on sloped portions of RFETS, may be readily eroded and add to surface water runoff and sediment transport. Erosion will be controlled; control methods are discussed in Section 6.0.

Remediated areas will be reclaimed by backfilling, recontouring, adding topsoil, and establishing a vegetative cover for soil stabilization and weed control. In the IA, where projects must be left temporarily in an interim state until all decommissioning and remediation work is completed, this temporary vegetative cover may be needed for several years. Temporary areas will be regraded and permanently revegetated using appropriate native plant species mixtures as the last action in the final configuration.

While efforts will be made to reserve as much available "clean" soil at RFETS as possible, the extent of soil contamination is not yet fully known. Because offsite disposal of soil and debris is anticipated, RFETS may be required to import a significant volume of replacement soil (estimated at 121,718 cubic meters [m^3], assuming all contaminated soil is taken offsite for disposal) for backfilling, recontouring, and use in revegetation.

12.2 AIR QUALITY

Remediation activities, including soil excavation, equipment operation, soil treatment, and transportation, will generate air pollutants. Regulated air pollutants include criteria air pollutants (i.e., ozone, CO, NOx, sulfur dioxide, lead, and particulate matter), hazardous air pollutants, and radiological air emissions. RFETS is located within the metropolitan Denver area that is designated as a "nonattainment" area with respect to NAAQS for PM_{10}, carbon monoxide, and ozone. This analysis is primarily concerned with fugitive particulate emissions and VOCs, because these are the pollutants most likely to be found in areas where soil is being excavated, transported (fugitive dust), and treated (onsite treatment for VOCs only) onsite. Engineering and administrative controls will be implemented prior to and during excavation activities to control

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the spread of radiological and hazardous contamination (e.g., dust suppression with water hoses, plastic liners) in accordance with job specific HASPs, ALARA Job Reviews, and RWPs. An estimated 121,718 m^3 of soil will be excavated and handled during remediation activities, requiring approximately 4,900 shipments for removal, treatment, and offsite disposal.

The pollutant most frequently generated by soil excavation and transport, and in the greatest amounts, will be fugitive dust, which includes TSP and PM_{10}, and 2.5 microns ($PM_{2.5}$) in size. It should be noted that $PM_{2.5}$ has only recently been identified as a regulated air pollutant, and requirements are not yet promulgated. The CID (DOE 1997d), which identified TSP as the primary air quality concern for both onsite and offsite receptors, concluded that the estimated TSP emissions will not have a substantial impact. The Draft CID Update (L-A 2000) focused on TSP and PM_{10}, and revised the original CID (DOE 1997d) analysis to incorporate three new sources (concrete crushing, pavement removal, and building demolition) as well as an accelerated closure schedule. While the updated analysis therefore shows that emissions will increase, the ER activities included in this RSOP, and the related impacts, will be less than those reported in the Draft CID Update (L-A 2000).

Dust emissions from remediation activities will be controlled with practical, economically reasonable, and technologically feasible work practices, as required by the CAQCC Regulation No. 1. Specifically, onsite dust will be controlled through dust minimization techniques, such as the use of water sprays to minimize suspension of particulates, and stopping earth-moving operations during periods of high wind. In addition, TSP and PM_{10} (as well as other criteria pollutants) will be monitored consistent with RFETS's IMP to ensure air emissions remain within acceptable levels. Opacity rules, limiting opacity below a 20-percent standard, also will be followed. Particulate emissions will be short-term and controllable, and emissions are not expected to be above enforceable NAAQS at the RFETS perimeter. In addition, the RFETS air quality staff calculates project emissions on an ongoing basis to determine additional regulatory reporting requirements. Therefore, potential impacts to workers and the public from proposed soil disturbances will not be significant.

Remediation activities also will include operation of vehicles, heavy machinery and other equipment that generate other criteria pollutants. Estimated concentrations of other criteria and hazardous air pollutants provided in the CID (DOE 1997d) were well below the most restrictive occupational exposure limit, with the exceptions of sulfur dioxide, nitrogen dioxide, and CO, which approached 50 percent of the most restrictive occupational exposure limit. The CID (DOE 1997d) identified the primary sources of these pollutants as diesel-powered emergency generators used to supply back-up power at RFETS. According to the Draft CID Update (L-A 2000), maximum daily emissions will remain about the same as forecast in the CID (DOE 1997d). Equipment emissions from remediation activities are expected to be substantially less than in the CID (DOE 1997d) and Draft CID Update (L-A 2000) estimates; therefore, impacts to workers and the public are not a concern in this RSOP. In addition, temporary fossil-fuel-fired equipment use and fuel use will be tracked to ensure that emissions remain within the regulatory limits, or that appropriate notices or permit modifications are filed.

Organic air pollutants (i.e., VOCs) may be released during the soil excavation. Organic air pollutants released during excavation activities were not modeled in the CID (DOE 1997d)

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because of their short-term nature, the limited availability of soil concentration data, and the uncertainties in estimation. The Draft CID Update (L-A 2000) analysis did not project a substantial impact (or change from the CID) (DOE 1997d) regarding organic air emissions. For purposes of this RSOP, the same assumptions made in the CID (DOE 1997d) are applied to remediation activities. In addition, a bounding assumption has been made that less than 1 ton of VOCs will be emitted from excavation and soil handling activities. Based on this assumption, RACT will be attained without implementing specific VOC controls for soil excavation, staging, and replacement during remediation, and estimated emissions are not expected to exceed inventory reporting thresholds. If thresholds are exceeded, necessary controls specified by the RFETS air quality staff will be instituted, and an APEN will be submitted to CDPHE. Therefore, impacts are not expected to be substantial.

Contaminated soil may be treated onsite using thermal desorption to remove VOCs. Because there is no existing treatment facility onsite, a vendor will supply a mobile unit for onsite treatment, and units will be relocated by truck to the site of waste generation. Organic contaminants will be removed from the soil within a closed system and condensed into a liquid phase. Air emission standards will be incorporated into the design of process vents associated with thermal desorption operations that will manage hazardous wastes with organic concentrations equal to or greater than 10 ppm (by weight). Because treatment will be within a closed system, volatile emissions will be limited and controlled; emissions will also be monitored. For the transfer and storage of VOCs, storage tanks and related equipment will be maintained to prevent detectable vapor loss to the maximum extent practicable.

Radiological concerns associated with dust emissions are triggered at an action level of 0.1 mrem/yr EDE to the most impacted member of the public. A 0.1 mrem/yr EDE typically warrants regulatory agency notification, and monitoring will be conducted as needed. Measures to control emissions from hazardous or radioactive areas will be identified to assure compliance with applicable air quality regulations. These and other measures will be designed to protect the health of workers, the public, and the environment. The CID (DOE 1997d) analysis presented radiological impacts in terms of annual doses to three receptors based on emissions from six point sources and two area sources at RFETS. Four of the six point sources included emissions from both operations and remediation activities, while emissions from the two other point sources and two area sources were a result of remediation activities only. The three receptors included a co-located worker, a maximally exposed individual at the Site boundary, and the local population within a 50-mile radius (assumed to be 2.7 million people). The annual dose for these three receptors was estimated in the CID (DOE 1997d) to be 5.3 mrem, 0.23 mrem, and 22.9 person-rem, respectively. Although the CID (DOE 1997d) did not provide sufficient detail to allow estimated doses in the Draft CID Update (L-A 2000) to be directly correlated to the CID (DOE 1997d), some bounding risk characterizations were derived in the Draft CID Update (L-A 2000). The upper-bound co-located worker dose was well within the administrative site limit of 750 mrem, exclusive of decommissioning, and the maximum exposed individual doses were substantially lower than the maximum annual allowable radiation dose of 10 mrem for a member of the public from DOE-operated nuclear facilities (also exclusive of decommissioning activities). These doses do not denote a substantial radiological air quality impact from remediation activities.

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General air conformity studies for nonattainment and maintenance areas are performed for most federal actions that exceed threshold quantities. However, CERCLA-related activities, such as the activities discussed in this RSOP, are exempted from air conformity requirements, a long as emissions meet the substantive requirements of the Prevention of Significant Deterioration (PSD) and New Source Review (NSR) permitting programs. Because emissions from the activities will meet PSD/NSR requirements, general conformity needs have been met.

12.3 WATER QUANTITY AND QUALITY

Remedial actions will affect water resources through excavation of contaminated soil. The goal of environmental remediation is to decrease the amount of contamination onsite and facilitate closure of RFETS. Consequently, long-term impacts to surface water and groundwater are projected to be beneficial.

Water impacts evaluated in the CID (DOE 1997d) included altering flow rates or flow paths, negative changes in floodplain capacities, and degradation of surface water quality or groundwater quality. Water quantity could be affected by excavation of soil (decreasing the depth to the water table and the net rate of aquifer recharge) and alteration of topography that can affect drainage pathways. Surface water quality impacts include increased surface water erosion and turbidity from excavation and stockpiling.

According to the CID (DOE 1997d), large-scale excavations may impact surface water flowpaths and infiltration to an extent that causes measurable localized differences in groundwater saturated thickness and flows. These groundwater impacts will be most noticeable in areas of shallow depths to water table and small, saturated thickness. However, CID (DOE 1997d) conclusions for both the alluvial aquifer and for the deeper aquifers are that contributions from the area to the regional groundwater basin are minimal. Therefore, remediation activities are expected to have negligible impact on regional hydrogeology.

Remediation activities will have the potential to adversely affect surface water quality through the release of runoff or other contaminants during excavation and soil stockpiling. Soil remediation involves excavations that could cause erosion and siltation of nearby surface water. However, the removal of contaminant sources is beneficial in the long-term because contaminant migration to groundwater and surface water is prevented.

Following excavation and other soil disturbances, the type of fill and soil management practices will also influence groundwater infiltration and surface water runoff. According to the CID (DOE 1997d), excavation of contaminated soil is expected to locally increase runoff and erosion over the short-term; however, the impacts should be minimal with proper mitigation. Prompt revegetation of open areas, especially sloped areas, also will reduce impacts to water quality.

12.4 HUMAN HEALTH AND SAFETY

Potential human health impacts to the public and co-located workers from remediation activities include fugitive dust, exposure to radioactive and hazardous materials, and traffic associated with onsite and offsite transportation of soil for treatment and disposal. Workers involved in

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remediation operations will also be subject to risks of operating heavy machinery, and, for some alternatives, operating treatment facilities.

As a measure of impacts to the public from remediation activities, the CID (DOE 1997d) reports the following estimated annual radiological doses from RFETS closure air emissions: maximally exposed co-located worker 5.4 mrem; maximally exposed member of the public 0.23 mrem; population dose 23 person-rem. The population dose will be expected to produce 0.012 latent cancer fatalities in the region of interest with a population of 2.7 million. Because these estimates include all RFETS closure activities, impacts from activities addressed in this RSOP will be a small fraction of those reported above.

Worker radiological dose estimates for all closure activities are presented in the CID (DOE 1997d), grouped by activity and by building cluster. A total worker dose of 383 rem is reported for decommissioning and remediation activities for the 371, 707, 771, 776/777, 779, 881, 886, and 991 building clusters. An additional worker dose of about 12 rem is predicted for miscellaneous production zones, TRU cluster, and IA and BZ decommissioning and remediation activities. The total reported dose to workers for these closure activities is about 395 rem. Because doses from decommissioning will dominate these exposures, remediation activities are expected to be a small fraction of the 395 rem reported in the CID (DOE 1997d).

In practice, remediation activities, which address soil with potential radiological contamination, will be subject to RFETS's radiation protection program, which includes administrative controls limiting the dose to any involved worker to a maximum of 500 mrem per year. Doses resulting from activities addressed in this RSOP are expected to comply with this limit. In addition, worker radiation protection for these activities will be governed by the ALARA principle, which mandates that worker exposures be further minimized on a cost-effective basis, consistent with the activities being conducted.

Risks to involved workers will be dominated by standard industrial hazards associated with heavy equipment operations associated with excavation, earth moving, and transportation equipment. A project-specific HASP Addendum and JHA will be prepared as described in Section 7.0.

Environmental impacts of transportation of LL and LLM waste from RFETS closure activities to disposal facilities is addressed in Attachment 3 of the Facility Disposition RSOP (DOE 2000b). The analysis includes transportation for disposal of all LL and LLM waste generated during RFETS closure and concluded that:

> "... impacts of shipping LLMW and LLW from RFETS to disposal sites on air quality, human health and safety, traffic, and environmental justice would be minimal." (DOE 2000b)

The Facility Disposition RSOP (DOE 2000b) transportation analysis does not directly address transportation of remediation-derived soil to offsite disposal or treatment facilities. However,

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because remediation waste is a component of LL and LLM waste that is shipped offsite, transportation impacts are expected to be similar to those for disposal alone.

12.5 ECOLOGICAL RESOURCES

Given the nature of remediation activities (e.g., earthmoving), this analysis focuses primarily on the assessment of potential physical impacts to ecological resources. The analysis of physical impacts, as taken from the CID (DOE 1997d), is based on a comparison of the location of activities to the location of ecological resources. The primary potential impacts include loss of productivity, injury or mortality, and the loss or modification of habitat. In general, the CID (DOE 1997d) found impacts to ecological resources from RFETS closure to be high in the short-term, but low in the long-term, based on the use of adequate controls for revegetation and weed control. It should be noted that the CID (DOE 1997d) also analyzed chemical impacts to ecological resources. However, the general findings were that, based on screening-level risk characterizations, ecological components (e.g., vegetation and soil) in several source areas contained contaminants at levels that represent low or negligible risk to wildlife.

Because the majority of areas impacted by remediation activities will occur in previously disturbed areas in the IA and reclaimed grasslands, impacts on vegetation will be considered low. The disturbance to wildlife and sensitive habitats from remediation activities could be substantial, although the impacts will be short-term. Coordinating activities with RFETS ecologists to avoid or minimize disturbance to habitats (through BMPs) and successful reclamation of RFETS will result in low long-term impacts.

RFETS provides habitat for several species of concern and at least one rare plant community (i.e., xeric tall grass prairie). Special-concern species are a particular class of wildlife and plants that are of special interest at RFETS because of their protected status or rarity (as identified by U.S. Fish and Wildlife Service, the Colorado Division of Wildlife, the Colorado Natural Heritage Program, and other interested groups). Rare plant communities likely include special-concern species as well as unique combinations of plants and animals. RFETS is also home to one federally listed threatened species, the Preble's meadow jumping mouse (PMJM). Remediation activities within the BZ may disturb areas supporting or potentially supporting these species. This disturbance could represent a substantial short-term physical impact to these species and their habitats. As in the IA, however, BMPs will be implemented to avoid and minimize impacts to these habitats. Particular care will be taken with the PMJM, including the implementation of special mitigation measures identified by RFETS ecologists (e.g., work shutdowns in certain areas of the BZ in spring to fall to avoid impacting the PMJM). In addition, remediation activities include the reclamation of the BZ. If soil restoration is suitable for an adequate re-establishment of native plant species, and if weeds are controlled, remediation activities will ultimately result in positive impacts to RFETS's ecological resources.

Remediated areas will be reclaimed by recontouring, adding topsoil, and revegetating as necessary. All areas will be reclaimed (e.g., topsoil added and blended with mulch and fertilizer) in accordance with revegetation procedures described in Section 5.12. Revegetation in the IA will be considered temporary until the final RFETS configuration. However, because of the size of the IA, even partial restoration will have a positive effect on plant and animal species at RFETS.

In addition to the direct physical impacts, remediation activities could also have indirect effects on RFETS's ecological resources. For example, soil erosion from disturbed areas or stockpiles could have an adverse impact on plants and animals. However, as discussed in Section 6.4, erosion control measures will be implemented.

12.6 CULTURAL RESOURCES

Because the history of RFETS, including all 64 buildings within the Historic District, has been properly documented in the Historic American Engineering Record (DOE 1998b), environmental remediation activities will have no adverse effect on historic resources. This documentation meets the requirements of the Programmatic Agreement signed by the DOE RFFO, the Colorado State Historic Preservation Officer, and the Advisory Council on Historic Preservation.

With respect to paleontological resources, the CID (DOE 1997d) indicates that rock exposures at RFETS are not fossil-bearing. Therefore it is unlikely that remediation activities will uncover paleontological resources. Undertakings at RFETS are unlikely to result in the deterioration or loss of any substantial paleontological resources.

Prehistoric resources at RFETS, according to the CID (DOE 1997d), are not considered substantial to the region's archaeological record. Therefore, undertakings at RFETS will be unlikely to result in the deterioration or loss of prehistoric resources. Mitigation will be recommended only in the event that new prehistoric or archaeological resources are uncovered during remediation activities. Procedures for emergency treatment of archeological resources in the BZ are addressed in the Cultural Resources Management Plan (DOE 1997e).

12.7 VISUAL CHANGES

Remediation activities will result in temporary and minor visual impacts during RFETS closure. However, the long-term visual changes to topography and vegetation cover resulting from remediation activities will be more notable. Remediation activities include the revegetation of soil to a native grassland appearance. In the BZ, the disturbed areas will be backfilled with clean subsoil and topsoil, regraded as necessary, and revegetated with a permanent cover using the appropriate native plant species mixture. In the IA, the vegetation cover will be temporary for interim stabilization of excavations and other areas to prevent erosion and weed invasion until completion of end-state revegetation during the final configuration. Temporary revegetation areas will be regraded and permanently revegetated using the appropriate native plant species mixture as the last action during the final configuration. The long-term effects of restoration activities will result in a significant change in RFETS's appearance and visibility to the public (from public roads and areas around RFETS) at closure. In particular, RFETS's IA will be reclaimed to a native grassland environment. As long as erosion and noxious weeds are controlled during remediation activities, the long-term visual effects will be increasingly beneficial as more and more of RFETS is restored to its natural landscape and appearance.

12.8 NOISE

Remediation activities include a temporary increase in local noise levels from the operation of heavy equipment, operation of onsite treatment facilities, and the loading and hauling of

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contaminated soil for offsite treatment and disposal. The CID (DOE 1997d) found that noise levels from industrial activities within the RFETS boundary were not distinguishable from background traffic noise levels. Noise levels from onsite construction, environmental restoration, waste disposal, demolition, and other activities were not expected to be perceptible at offsite locations. Therefore, noise levels from onsite remediation activities alone are not expected to be perceptible at offsite locations.

The primary source of noise to nearby residential areas remains traffic movement along local streets and state routes. Remediation activities will result in higher public noise levels due to the increased number of trips for fill and waste transport. However, the effects will be short-term, occurring intermittently during daylight hours and lasting for several years. The Draft CID Update (L-A 2000) identified increased offsite traffic relative to the CID (DOE 1997d) due to the shorter closure time, but found that the additional traffic noise will not cause a doubling of noise levels (Draft CID Update (L-A 2000). It indicated that most public reviews of traffic noise by federal and state agencies consider a doubling of sound (10 decibels or greater) to be a moderate to substantial increase. Because traffic, including truck traffic, is already prevalent along the proposed trucking routes, it was concluded in the Draft CID Update (L-A 2000) that the potential impact is considered low. Given that the CID (DOE 1997d) and Draft CID Update (L-A 2000) analyses considered offsite waste management transport (LL, LLM, and sanitary waste) and work force commuters, in addition to remediation waste transport, offsite noise impacts from remediation activities alone will be considerably less.

Conclusions in the Draft CID Update (L-A 2000) indicated that higher worker noise levels will result from remediation and other closure activities because of the accelerated closure schedule; however, the overall impact will be low. Therefore, the impacts from remediation activities alone will be considered even lower.

12.9 TRANSPORTATION

Environmental remediation activities will produce soil wastes that require onsite transportation for treatment or interim storage, the reuse of treated ("clean") RFETS soil, the treatment and disposal of RFETS contaminated soil at offsite facilities, and the importing of clean soil from offsite locations. Potential transportation impacts include increased air emissions, increased traffic congestion, and transportation accidents. Tailpipe emissions and airborne particulate matter generated by the anticipated truck traffic is projected to be well below regulatory standards and will not reach a level of concern. Because of stringent DOT packaging and shipping standards, cargo-related accidents will pose minimal concern to human health and safety. The Draft CID Update (L-A 2000) analyzed traffic in terms of increased highway and road congestion resulting from RFETS-related traffic. The analysis found that, despite the accelerated schedule, onsite and offsite traffic levels will actually decrease relative to those analyzed in the CID (DOE 1997d). Scheduling shipments during the off-peak hours will further minimize the number of shipments made during morning and evening rush hours when commuters will add to the congestion.

Because transportation impacts from remediation activities will derive primarily from material shipping, they are the focus of this analysis. Current nonradiological, LL, and LLM waste volumes projected for storage and disposal between 2001 and 2006 total 121,718 m^3 (8,328 m^3

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of nonradiological waste, 81,818 m^3 of LL waste, and 31,572 m^3 of LLM waste), with the highest volume in 2006 of 41,158 m^3. While the waste will likely be stored onsite in rolloff containers and shipped offsite in metal crates, this analysis assumes the most conservative packaging (55-gallon drums with 25 m^3 to a truck). In addition, offsite treatment and disposal will result in the greatest number of trips. It is assumed that an equal number of shipments is required to import replacement soil as is used to transport the waste offsite. Given these assumptions, the projected number of shipments for LL, LLM, and hazardous waste for remediation activities is as follows:

1. Total Shipments

   121,718 m^3/25 m^3 per shipment = 4,870 shipments (total)

   4,870 shipments offsite + 4,870 shipments onsite = 9,740 shipments total

2. Peak Year Shipments (2006)

   41,168 m^3/25 m^3 per shipment = 1,647 shipments (peak year 2006)

   1,647 shipments + 1,647 shipments = 3,294 shipments (peak year 2006)

In comparison, the CID (DOE 1997d) projected a total of 94,480 waste shipments of LL and LLM waste alone over a 10-year period, while the Draft CID Update (L-A 2000) projected a reduced number of shipments – 24,928 shipments of LL and LLM waste between FY00 and FY06. The Draft CID Update (L-A 2000) found that annual impacts on traffic will be of smaller magnitude than originally estimated in the CID (DOE 1997d), and traffic associated with RFETS operations will be eliminated earlier. The CID (DOE 1997d) noted that the effects of increased traffic entering and leaving RFETS will intensify. However, the increased materials shipments will be offset by the eventual decreases in commuter traffic. Overall, the effects were not projected to be substantial. Given that the Draft CID Update (L-A 2000) projected lower traffic impacts than CID (DOE 1997d), and remediation activities will contribute only a fraction of shipments to the overall traffic levels expected on and in the vicinity of RFETS, traffic impacts from remediation activities are not expected to be substantial.

In addition to being analyzed in the CID (DOE 1997d) and CID Update (L-A 2000), transportation of RFETS wastes has been analyzed from a NEPA perspective in the following NEPA documents: Final Waste Management Programmatic Environmental Impact Statement for Managing, Treatment, Storage, and Disposal of Radioactive and Hazardous Waste (DOE 1997f); Environmental Assessment Finding of No Significant Impact for Temporary Storage of Transuranic and Transuranic Mixed Waste (DOE 1999e); Attachment 3 of the Facility Disposition RSOP (DOE 2000b); and the Final Environmental Impact Statement for the Nevada Test Site and Offsite Locations in the State of Nevada (DOE 1996b). These documents analyzed impacts of offsite shipment of RFETS waste to potential treatment and disposal locations including NTS, Envirocare, and Hanford (the Facility Disposition RSOP, in particular, addressed remediation waste). These studies have found that impacts of waste shipments are small, and the shipments themselves contribute to an overall reduction of risk at RFETS.

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12.10 SOCIOECONOMICS/ENVIRONMENTAL JUSTICE

The primary socioeconomic factors considered in the CID (DOE 1997d) and re-examined in the Draft CID Update (L-A 2000) were employment, local economy, population and housing, and quality of life. Potential socioeconomic impacts from remediation activities relate primarily to the change in direct RFETS workforce and other direct employment (related to RFETS activities) during the period of performance.

The Draft CID Update (L-A 2000) used an assumed 1999 workforce of 5,750, which included direct employees (DOE, K-H, and first tier team of subcontractors) and other direct employees. The Draft CID Update (L-A 2000) projected a steady decline in direct RFETS employment to approximately 4,000 workers in 2004, followed by a sharper decline to 1,000 workers or less in 2006, and 0 workers at the time of RFETS closure. In comparison, ER activities will increase in 2002 and 2003 and again in 2005 and 2006 when the majority of work areas will be remediated and the largest volumes of soil will be handled. Remediation workers will represent an increasing percentage of RFETS workers as closure approaches, accounting for the highest percentage in 2006. In some respects, this contribution is positive in that it helps to offset workforce reductions in other areas, and reduces, to some extent, the significant decline in employment that will occur in the last two years of RFETS closure. Overall, the impacts of remediation activities on RFETS employment are smaller in size, but one component of the overall impacts of RFETS closure that will ultimately result in a RFETS workforce of zero by 2007. The CID (DOE 1997d) and Draft CID Update (L-A 2000) both identified negative short-term, localized impacts from the workforce reductions. However, they also indicated that the negative changes to RFETS employment would be counterbalanced by projected growth in other segments of the local economy. In particular, the overall socioeconomic impacts to the Denver Metropolitan Area and to Colorado are not expected to be substantial. It is also important to note that the remediation of environmental contamination, a direct result of remediation activities, will result in a positive impact to the public's perceived "quality of life."

With respect to potential environmental justice impacts, there are no minority (i.e., population greater than 50 percent minority) or low-income neighborhoods within a 10-mile radius of RFETS (L-A 2000). Therefore, no environmental justice impacts are anticipated from remediation activities within 10 miles of RFETS. Human health impacts from radiological and nonradiological air emissions and offsite transportation from remediation activities were addressed in Section 6.1 of this RSOP. Because the level of increased risk to the maximally exposed individual was determined to be small, no adverse human health impacts are anticipated for any segment of the population, including minority and low-income populations. Therefore, no environmental justice impacts could occur.

12.11 CUMULATIVE EFFECTS

The activities proposed in this RSOP support the overall mission to clean up RFETS and make it safe for future uses. The cumulative effects of this broader, sitewide effort are presented in the CID (DOE 1997d) and Draft CID Update (L-A 2000), which describe the short- and long-term effects from the overall clean-up mission. This section incorporates analyses from the Draft CID Update (L-A 2000) to identify activities and time frames that are cumulative. Potential

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cumulative effects from proposed remediation activities include air emissions, visual impacts, noise, and traffic impacts.

The primary focus of the CID (DOE 1997d) was on cumulative impacts resulting from onsite activities implemented through RFETS closure. Cumulative impacts result from the proposed RFETS activities and the effects of other actions taken during the same time in the same geographic area, including offsite activities, regardless of what agency or person undertakes such other action. The Draft CID Update (L-A 2000) analysis included updated onsite and offsite transportation requirements, as well as several new offsite activities, although the future non-DOE projects are relatively uncertain. Increased traffic congestion will be the most noticeable impact according to the Draft CID Update (L-A 2000), resulting from increased RFETS traffic and other planned or proposed construction projects near RFETS. Air pollutants and noise will also have adverse impacts; however, the impacts are expected to be short-term in nature, with staggered project start and completion dates. Most people will perceive a positive, long-term visual and "quality of life" benefit, as RFETS infrastructure and remediation equipment is removed, returning RFETS to a more natural appearance.

12.12 UNAVOIDABLE ADVERSE EFFECTS

Some temporary adverse effects will occur as a result of remediation activities. Surface and subsurface soil conditions will change; most conditions will be improved, but some changes will be adverse. Minor quantities of pollutants may be released to the atmosphere and surface water. Workers will experience health and safety risks typical of construction projects and potential chemical and radiation exposures. Noise levels will increase slightly, as will traffic and associated congestion. Most effects will be temporary; some changes to surface and subsurface soil will be permanent. Activities will be planned and executed such that no effects exceed regulatory limits. All environmental, safety, and health risks will be managed in accordance with industry practices, DOE policy, and RFETS programs.

12.13 SHORT-TERM USES VERSUS LONG-TERM PRODUCTIVITY

The purpose of remediating contaminated soil at RFETS is to improve the long-term productivity of RFETS. The ultimate goal at the end-state configuration is to restore the entire IA, as well as those portions of the BZ that have been previously disturbed or contaminated, to their natural state. Remediation activities will make significant advances in reaching this goal. Specifically, they will result in the permanent restoration of the BZ to its natural state, and the temporary restoration of the IA to provide interim stabilization until final remediation of this area. Ultimately, the IA will be regraded and permanently revegetated using appropriate native plant species mixtures as the last action in the final RFETS configuration. In the long-term, the improved productivity will help to support a range of potential future uses of the RFETS.

12.14 IRREVERSIBLE AND IRRETRIEVABLE COMMITMENTS OF RESOURCES

Remediation activities will result in the irretrievable consumption of funds, labor, equipment, fuel, tools, water, PPE, waste storage containers, and small quantities of other materials. Some resources will be recovered (e.g., treated soil that is no longer contaminated).

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13.0 PUBLIC PARTICIPATION

Stakeholder input to the ER RSOP is solicited and received through:

- The formal RFCA RSOP review process, which incorporates the requirements of CERCLA and RCRA;
- Public meetings, including:
  - The Rocky Flats Citizens Advisory Board (RFCAB);
  - The Rocky Flats Water Working Group;
  - The Rocky Flats Coalition of Local Governments (RFCLoG); and
  - The Rocky Flats Cleanup Agreement Stakeholders Focus Group.

Communication with stakeholders is also facilitated by use of the Internet. The site Internet site (www.rfets.gov) has a link to the Environmental Data Dynamic Information Exchange (EDDIE), which includes Site environmental information. The ER section contains current reports and information. Additionally, the site contains information on upcoming public meetings, reports for public comment, and other environmental and decommissioning information.

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14.0 RECORDS DISPOSITION

Upon completion of the public comment period for this Draft ER RSOP, comments received from the public (including the regulatory agencies), the comment responsiveness summary, and the LRA approval letter will be incorporated into the RSOP AR File, along with a copy of the approved RSOP and copies of the RFETS documents referenced in this RSOP.

For each ER project that implements this RSOP, the AR File will contain the RSOP Notification Letter, including scoping meeting minutes, unit-specific information for RCRA-regulated units undergoing closure, and the ER Final Closeout Report for the project. In addition, project-specific information, such as characterization data, project correspondence, work control documents, and other information generated as a direct result of each ER project, will be filed in the Project Record and the AR, and RCRA records and closure documents will be maintained with the RCRA Operating Record. Both the Project Record files and the RCRA Operating Record files will be transferred to Site Records Management upon completion of the ER Final Closeout Report for each ER project.

The following information repositories have been established to provide public access to the AR Files for the Rocky Flats Closure Project:

EPA Region VIII
Superfund Records Center
999 18th Street, Suite 500
Denver, Colorado 80202-2466
(303) 312-6312

Rocky Flats Citizens Advisory Board
9035 Wadsworth Parkway
Suite 2250
Westminster, Colorado 80021
(303) 420-7855

CDPHE
Information Center, Building A
4300 Cherry Creek Drive South
Denver, Colorado 80220-1530
(303) 692-2037

DOE Rocky Flats Public Reading Room
Front Range Community College
College Hill Library
3705 West 112th Avenue
Westminster, Colorado 80030
(303) 469-4435

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15.0 REFERENCES

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DOE Order 5400.5, Radiation Protection of the Public and the Environment.

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DOE, 1999d, RFCA Standard Operating Protocol for Recycling Concrete, Rocky Flats Environmental Technology Site, Golden, Colorado, September.

DOE, 1999e, Environmental Assessment Finding of No Significant Impact for Temporary Storage of Transuranic and Transuranic Mixed Waste, Rocky Flats Field Office, Golden, Colorado, August.

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DOE, 2000d, Final Report on Phase Speciation of Pu and Am for Actinide Migration Studies, Rocky Flats Environmental Technology Site, Golden, Colorado.

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Glossary

Accelerated Action: Those expedited response actions approved as a PAM, IM/IRA, or RSOP.

Action Level (AL): Numeric levels based on risk that, when exceeded, trigger an evaluation, remedial action, or management action. The action levels for surface soil were developed to be protective of human exposure under the designated land use conditions. Subsurface soil action levels for many organics were developed to be protective of groundwater. Metal and radionuclide subsurface soil action levels are equal to surface soil action levels.

Analytical Services Division (ASD): The Analytical Services Division of K-H is responsible for managing offsite laboratory contracts, data validation, and archiving analytical data.

Applicable or Relevant and Appropriate Requirements (ARARs): ARARs are promulgated standards, requirements, criteria, or limitations that will be met during closure activities to ensure the protection of human health and the environment and to ensure proper management of waste. A requirement under environmental laws may be either "applicable" or "relevant and appropriate."

Applicable requirements are those cleanup standards, standards of control, and other substantive requirements, criteria, or limitations promulgated under federal or state environmental or facility siting laws that specifically address a hazardous substance, pollutant, contaminant, remedial action, location, or other circumstance at a CERCLA site. Only those standards that are identified by a state in a timely manner and that are more stringent than federal requirements may be applicable. (40 CFR 300.5)

Relevant and appropriate requirements are those cleanup standards, standards of control, and other substantive requirements, criteria, or limitations promulgated under federal environmental or state environmental or facility siting laws that, while not applicable to a hazardous substance, pollutant, contaminant, remedial action, location, or other circumstance at a CERCLA site, their use is well suited to the particular site. Only those standards that are identified by a state in a timely manner and that are more stringent than federal requirements may be applicable. (40 CFR 300.5)

Area of Concern (AOC): The area of concern is an area that has soil with analytical results greater than background plus two standard deviations for metals or radionuclides or greater than detection limits for organics. The area of concern is the area over which data will be aggregated to make accelerated action decisions.

Asbestos: Asbestiform varieties of chrysolite, amosite (cummintonite-grunerite), crocidolite, anthophyllite, tremolite, and actinolite.

Asbestos Containing Material (ACM): Material containing more than 1 percent friable asbestos.

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Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA): CERCLA, 42 U.S.C. §9601 *et seq.*, as amended by the Superfund Amendments and Reauthorization Act of 1986, Pub. L. 99-499, and the Community Environmental Response Facilitation Act, Pub. L. No. 102-26; and the National Contingency Plan and other implementing regulations. (RFCA ¶25[m])

Closure: In the context of RCRA/CHWA hazardous waste management units, closure means actions taken by an owner or operator of a treatment, storage, or disposal unit to discontinue operation of the unit in accordance with the performance standards specified in 6 CCR 1007, §264.11 or §265.111, as appropriate. (RFCA ¶25[p])

Closure Project Baseline: The current baseline scheduled scope of work for RFETS. It includes cost, schedule, and technical performance for activities.

Confidence Level: The quantity $(1-\alpha)100\%$ associated with the confidence interval. A quantitative measure of the limit about the true mean at a given a level of probability. For example, the precision level at which the sample mean estimate is to the population mean.

Contamination Reduction Zone (CRZ): The area at a hazardous waste site that has been set aside for the decontamination of equipment and personnel.

Deactivation: The process of placing a building, a portion of a building, or building component (as used in the rest of this paragraph "building") in a safe and stable condition to minimize the long-term cost of a surveillance and maintenance program in a manner that is protective of workers, the public, and the environment. Actions during deactivation could include the removal of fuel, draining and/or de-energizing of nonessential systems, removal of stored radioactive and hazardous materials, and related actions. As the bridge between operations and decommissioning, based upon Decommissioning Operations Plans or the Decommissioning Program Plan, deactivation can accomplish operations-like activities such as final process runs, and also decontamination activities aimed at placing the facility in a safe and stable condition. Deactivation does not include decontamination necessary for the dismantlement and demolition phase of decommissioning (i.e., removal of contamination remaining in fixed structures and equipment after deactivation). Deactivation does not include removal of contaminated systems or equipment except for the purpose of accountability of Special Nuclear Material (SNM) and nuclear safety. It also does not include removal of contamination except as incidental to other deactivation or for the purposes of accountability of SNM and nuclear safety. (RFCA ¶25 [y])

Debris: All nonsoil material found during ER remediation.

Decommissioning: Decommissioning means, for those buildings, portions of buildings, or building components (as used in the rest of this paragraph, "building") in which deactivation occurs, all activities that occur after the deactivation. It includes surveillance, maintenance, component removal, decontamination and/or dismantlement and size reduction for the purpose of retiring the building from service with adequate regard for the health and safety of workers and the public and protection of the environment. For those buildings in which no deactivation

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occurs, the term includes characterization, surveillance, maintenance, component removal, decontamination and/or dismantlement and size reduction for the purpose of retiring the building from service with adequate regard for the health and safety of workers and the public and protection of the environment. (RFCA ¶25[z])

Decontamination: The removal or reduction of radioactive or hazardous contamination from facilities, equipment, or soils by manual, mechanical, chemical, or other means.

Dense Non-Aqueous Phase Liquid (DNAPL): An organic liquid, composed of one or more contaminants that is heavier than water and does not mix with water (chlorinated solvents).

Derived Air Concentration (DAC): The derived air concentration is used to: 1) estimate the potential dose from inhalation of workers exposed to airborne radioactive material; 2) determine the appropriate level of PPE required in an area; 3) evaluate the efficacy of engineering controls; and, 4) evaluate the need to perform a dose assessment.

The DAC is the concentration of a given radionuclide in air which if breathed by reference man for 2000 hours (assumed to be one working year), under conditions of light work (assumed air inhalation rte of 1.2 m^3/h), results in an intake of one annual limit on intake.

Dismantlement: The demolition and removal of any building or structure or a part thereof during decommissioning. (RFCA ¶25[ab])

Facilities: Buildings and other structures, their functional systems and equipment, and other fixed systems and equipment installed therein; outside plant, including site development features such as landscaping, roads, walks, and parking areas; outside lighting and communication systems; central utility plants; utilities supply and distribution systems; and other physical plant features.

Geographic Information System (GIS): A computer based system that manages spatial data sets. A GIS can be defined as an organized collection of computer hardware, software, geographic data, and personnel designed to efficiently capture, store, update, manipulate, analyze, and display all forms of geographically referenced data. In other words, a computer system capable of holding and using data describing places on the earth's surface.

Geostatistical Spatial Correlation: The relationship between spatial measurements. The concept of spatial correlation is that nearby sampling points are alike. Spatial correlation can be characterized through the use of the semi-variogram model, which provides a measure of variance as a function of distance between data points. This measure is defined as half of the average squared difference between two values separated by vector h.

Global Positioning System (GPS): The GPS is a constellation of 24 satellites that is used for navigation and precise geodetic position measurements. The GPS satellites are operated by the United States Department of Defense. GPS provides specially coded satellite signals that can be processed in a GPS receiver, enabling the receiver to compute position, velocity and time. Four

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GPS satellite signals are used to compute positions in three dimensions and the time offset in the receiver clock.

Hazard: A source of danger (i.e., material, energy source, or operation) with the potential to cause illness, injury, or death to personnel, or damage to a facility or the environment without regard for the likelihood or credibility of accident scenarios or consequence mitigation.

Hazardous Waste: Hazardous waste is any solid waste that either exhibits a hazardous characteristic (i.e., ignitability, corrosivity, reactivity, or toxicity) or is named on one of three lists published by EPA in 40 CFR 261, *Identification and Listing of Hazardous Waste*. To be considered hazardous, a waste must first meet EPA's definition of "solid waste," which includes liquids.

Histogram: A multiple-bar diagram showing relative abundance of material or quantitative determinations (contaminant concentration) divided into a number of regulatory arranged groups.

Interim Measure (IM): The RCRA/CHWA term for a short-term action to respond to imminent threats, or other actions to abate or mitigate actual or potential releases of hazardous wastes or constituents.

Interim Remedial Action (IRA): The CERCLA term for an expedited response action performed in accordance with remedial action authorities to abate or mitigate an actual or potential threat to public health, welfare, or the environment from the release or threat of a hazardous substance from RFETS.

Inverse Distance Weighting (IDW): Inverse Distance is a simple interpolant. The basic premise of inverse distance is that data points are weighted by the inverse of their distance to the estimation point. This approach has the effect of giving more influence to nearby data points than those farther away. Additionally, the inverted distance weight can be raised to further reduce the effect of data points located farther away.

Isopleth: A line, on a map or chart, drawn through points of equal size or abundance.

Job Hazard Analysis: An analysis of procedurally controlled activities that uses developed procedures as a guide to address and consider the hazards due to any exposures present during implementation of (job) procedures, the use and possible misuse of tools, and other support equipment required by the procedures. A type of hazard analysis process that breaks down a job or task into steps, examines each step to determine what hazard(s) exist or might occur, and establishes actions to eliminate or control the hazard.

Kriging: The spatial correlation model derived from the variogram analysis is used in the kriging simulation. Kriging is the process of simulating predicted values in unsampled areas by calculating a weighted least-squares mean of the surrounding data points. The weighted values account for not only the distance between known observations and points of predicted values, but also the correlation of clustered observations. For example, clustered data may provide redundancy and are weighted less than a single observation at an equal distance in a different

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direction. The kriging simulations are processed to produce maps defining the spatial distribution of the contaminants and uncertainty in the spatial distribution.

Probability kriging is based on multiple simulations of the contaminant concentration. The outcome of each simulation reflects the actual observations within the area. The multiple simulations of the concentrations provide the basis for determining the relative uncertainty so the probability of exceeding a specified threshold value (e.g., RCFA ALs) at any point within the area can be estimated. The simulations are processed to produce maps defining the spatial distribution of the contaminants and the inherent uncertainty in spatial distribution.

Lead Regulatory Agency (LRA): The LRA is the regulatory agency (EPA or CDPHE) that is assigned approval responsibility with respect to actions under RFCA and at a particular OU pursuant to Part 8 of RFCA. In addition to its approval role, the LRA will function as the primary communication and correspondence point of contact. The LRA will coordinate technical reviews with the Support Regulatory Agency and consolidate comments, assuring technical and regulatory consistency, and assuring that all regulatory requirements are addressed. (RFCA ¶25[aq])

Light Non-Aqueous Phase Liquid (LANPL): Liquids that do no mix with water and are lighter than water (gasoline, fuel oil).

Low-Level (LL) Waste: LL waste is any radioactive waste that is not classified as TRU waste, high-level waste, or spent nuclear fuel. No minimum level of radioactivity has been specified for LL waste. LL waste mixed with hazardous waste is referred to as LLM waste.

Metadata: Information that describes other primary data used within the decision management system (e.g., a description field within an ACCESS database).

Operable Unit (OU): OU means a grouping of IHSSs into a single management unit.

PCB Bulk Product Waste: Waste derived from manufactured products containing PCBs in a nonliquid state, at any concentration where the concentration at the time of designation for disposal was equal to or greater than 50 ppm PCBs. PCB bulk product waste excludes PCBs or PCB items, but includes: (1) nonliquid bulk waste or debris from the demolition of buildings and other man-made structures; (2) PCB-containing waste from the shredding of automobiles, household appliances, or industrial appliances; (3) plastics, preformed or molded rubber parts and components, applied dried paints, varnishes, waxes, or other similar coatings or sealants, caulking, adhesives, paper, Galbestos, sound-deadening or other types of insulation, and felt or fabric products such as gaskets; and 4) fluorescent light ballasts containing PCBs in the potting material.

PCB Item: Any PCB article, article container, PCB container, or PCB equipment, that deliberately or unintentionally contains, or has as a part of it, any PCB or PCBs. This category includes electrical equipment such as transformers, capacitors, and switches.

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PCB Remediation Waste: Waste containing PCBs as a result of a spill, release, or other unauthorized disposal, at the following concentrations: (1) materials disposed prior to April 18, 1978, that are currently at concentrations greater than or equal to 50 ppm PCBs, regardless of the concentration of the original spill; (2) materials which are currently at any volume or concentration where the original source was greater than or equal to 500 ppm PCB beginning on April 18, 1978, or greater than or equal to 50 ppm beginning on July 2, 1979; and (3) materials which are currently at any concentration if the PCBs are from a source not authorized for use under 40 CFR Part 761.

PCB remediation waste means soil, rags, and other debris generated as a result of any PCB spill cleanup, including, but not limited to the following: (1) environmental media containing PCBs, such as soil and gravel; dredged materials, such as sediments; settled sediment fines, and decanted aqueous liquid from sediment; (2) sewage sludge containing less than 50 ppm PCBs and not in use in accordance with §760.20(a) [relating to uses of sewage sludge regulated under Parts 257, 258, and 503 of 40 CFR]; (3) PCB sewage sludge, commercial or industrial sludge contaminated as a result of a spill of PCBs, including sludge located in or removed from any pollution control device, and decanted aqueous liquid from an industrial sludge; and (4) buildings and other man-made structures, such as concrete or wood floors or walls contaminated from a leaking PCB or PCB-contaminated transformer; porous surfaces; and nonporous surfaces.

Process Waste: Process waste is solid, hazardous, and mixed waste generated as a result of normal building operations and deactivation activities. Process waste includes mixed residues; liquids, sludges, and oils in tanks and ancillary equipment; containerized waste generated prior to approval of this RSOP; and liquid waste chemicals (no matter when generated).

Process Waste Line: Process waste lines are pipelines that carry process waste from the process system to the waste treatment system. At RFETS, the NPWL system is currently in operation. The OPWL was replaced by the NPWL.

Radiological Buffer Zone (RBZ): An intermediate area established to prevent the spread of radioactive contamination and to protect personnel from radiation exposure. The area surrounds or is contiguous with Contamination Areas, High Contamination Areas, Airborne Radioactivity Areas, Radiation Areas, or High Radiation Areas.

Radiological Contamination: Radioactive material present in a location where it should not be present.

RCRA Stable: A step toward RCRA closure, whereby wastes are removed from a RCRA-regulated unit thereby eliminating the possibility of future waste input. For tank systems, this means a tank and its ancillary equipment have been drained to the maximum extent possible using readily available means, with the objective of achieving less than 1 percent holdup, and with no significant sludge and no significant risk remaining. Physical means must then be used to ensure no waste is re-introduced to the system (e.g., lock out/tag out, blank flanges).

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Release Site: A site where a hazardous or radioactive waste, hazardous constituent, or radionuclide was released to the environment.

Remediation Waste: Remediation waste includes all solid, hazardous, and mixed waste; all media and debris containing hazardous substances or listed hazardous or mixed wastes, or exhibiting a hazardous characteristic; and all hazardous substances generated from activities regulated under RFCA as RCRA corrective actions or CERCLA response actions, including decommissioning under an approved decision document. Remediation waste includes Waste generated from decommissioning activities performed under this RSOP, solid waste chemicals (no matter when generated), and residual liquids or sludges remaining in "RCRA stable" or "physically empty" tanks. Remediation waste does not include waste generated from other activities (e.g., normal building operations and deactivation activities).

Resource Conservation and Recovery Act (RCRA): RCRA, 42 U.S.C. §6901 *et seq.*, as amended by the Hazardous and Solid Waste Amendments of 1984, the Federal Facility Compliance Act of 1992, and implementing regulations. (RFCA ¶25[ay])

RCRA-Regulated Units: Those treatment, storage, or disposal areas that are regulated under the RCRA.

RFCA Standard Operating Protocol (RSOP): Approved protocol applicable to a set of routine environmental remediation and/or decommissioning activities regulated under RFCA that DOE may repeat without re-obtaining approval after the initial approval because of the substantially similar nature of the work to be completed. Initial approval of an RSOP will be accomplished through an IM/IRA process.

Sanitary Waste:

Routine Sanitary Waste This type of sanitary waste is collected in dumpsters located throughout RFETS. Typically these wastes consist of soft or compactable items generated by office/administrative and cafeteria areas and do not required a radiological WRE prior to generation or disposal into dumpsters. Typical routine sanitary waste includes packaging and general office refuse; food waste from cafeteria or offices; nonrecyclable paper, cardboard, and miscellaneous glass; metal; rubber; and plastic items from routine office/administrative operations.

Special Sanitary Waste. Special sanitary waste is sanitary waste that requires specific treatment, analysis, certification, and/or packaging prior to disposal offsite. Special sanitary waste includes asbestos and beryllium waste that is not hazardous waste.

Spatial Variability: Measure of the differences between sampling points. The spatial variability is defined by the semivariogram model.

Substantive Requirements: Substantive requirements are those requirements that pertain directly to actions or conditions in the environment. Examples include quantitative health- or risk-based restrictions upon exposure (for particular contaminants), technology-based

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requirements for actions taken upon hazardous substances (e.g., incinerator standards requiring particular destruction and removal efficiency), and restrictions upon activities in certain special locations (e.g., standards prohibiting certain types of facilities in a floodplain).

Triangulation: The laying out and accurate measurement of a network of triangles.

Upper Confidence Limit (UCL): A random interval that is based on the upper bound of random variables that are computed from sample statistics. That is, prior to taking a single sample, the probability that the confidence interval will contain that particular sample measurement.

Variogram: Fundamental geostatistical tool used to define the spatial correlation structure of spatial data sets. The variogram is used to compare paired sample data at different locations at given separation distances. The semi-variogram model is used to define the nugget, sill, and range, which are imperative kriging parameters.

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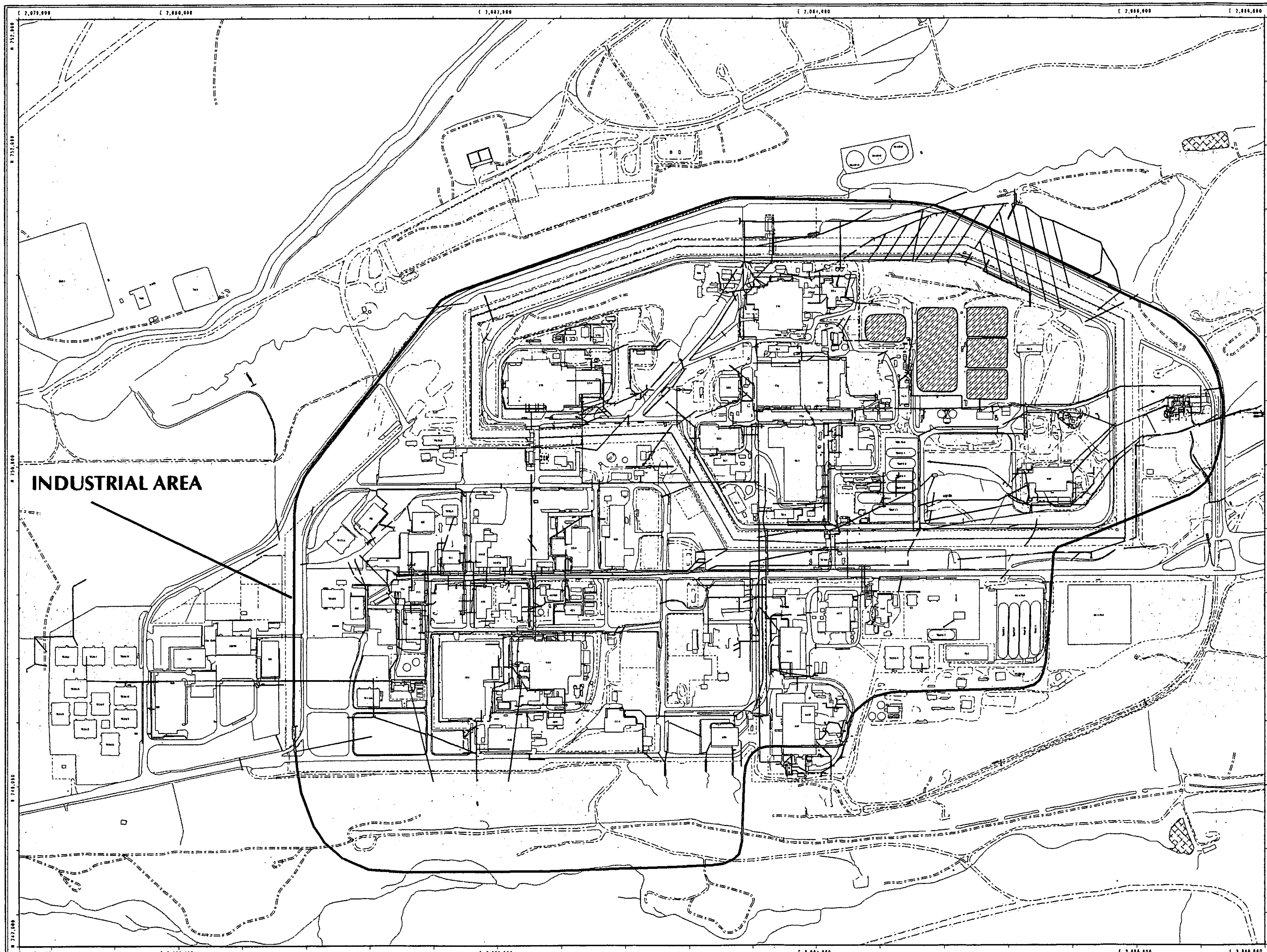

Figure 14

New Process Waste Lines, Sanitary Sewer System and Storm Drains

IHSS Groupings

- Storm Drains - 000-3
- Sanitary Sewer System - 000-3
- PAC, IHSS, UBC site, or Tank

Other Map Features

- Buildings and other structures
- Solar Evaporation Ponds (SEP)
- Lakes and ponds
- Streams, ditches, or other drainage features
- Fences and other barriers
- Paved roads
- Dirt roads
- Industrial Area Operable Unit Boundary

DATA SOURCE BASE FEATURES:

The utilities (above-ground and underground) information was supplied by EG&G Facilities Department in DXF format, Aug 1993. The GIS Department created ARC coverages (data layers) from the DXF files and converted the data from Rocky Flats Coordinate system to State Plane Coordinate system.
NOTE: This data HAS NOT BEEN edited or coded (with attributes information).

Buildings, fences, hydrography, roads and other structures from 1994 aerial fly-over data captured by EG&G RSL, Las Vegas.
Digitized from the orthophotographs. 1/95

Scale = 1 : 7720
1 inch represents approximately 643 feet

200 0 400 800ft

State Plane Coordinate Projection
Colorado Central Zone
Datum: NAD27

U.S. Department of Energy
Rocky Flats Environmental Technology Site

GIS Dept. 303-966-7707

Prepared by:
DynCorp
THE ART OF TECHNOLOGY

Prepared for:
KAISER-HILL COMPANY

MAP ID: 2k-0411
July 03, 2001

NT_Svr w:/projects/fy2k/2k-0411/ia-strategy_fig14.aml

77

Figure 5
Draft ER RSOP
Key Project Interfaces

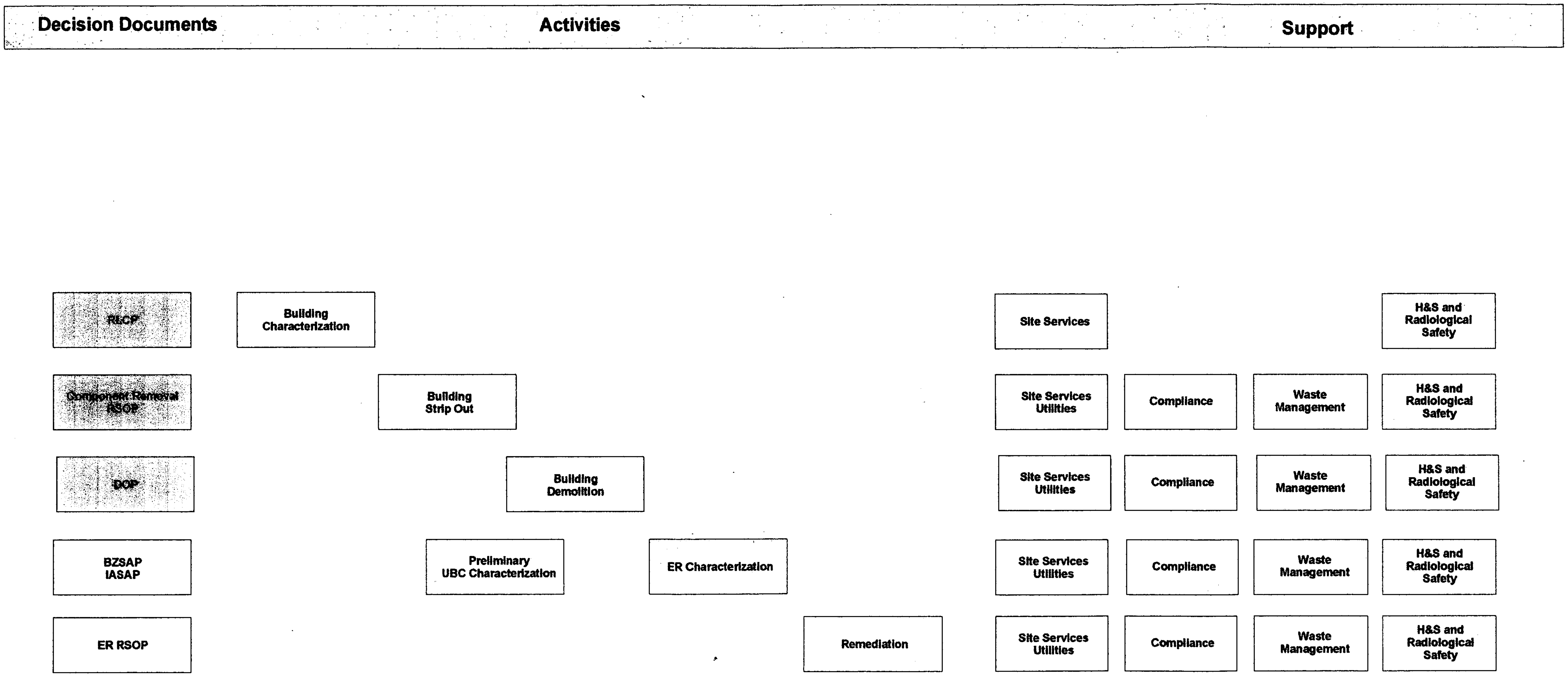

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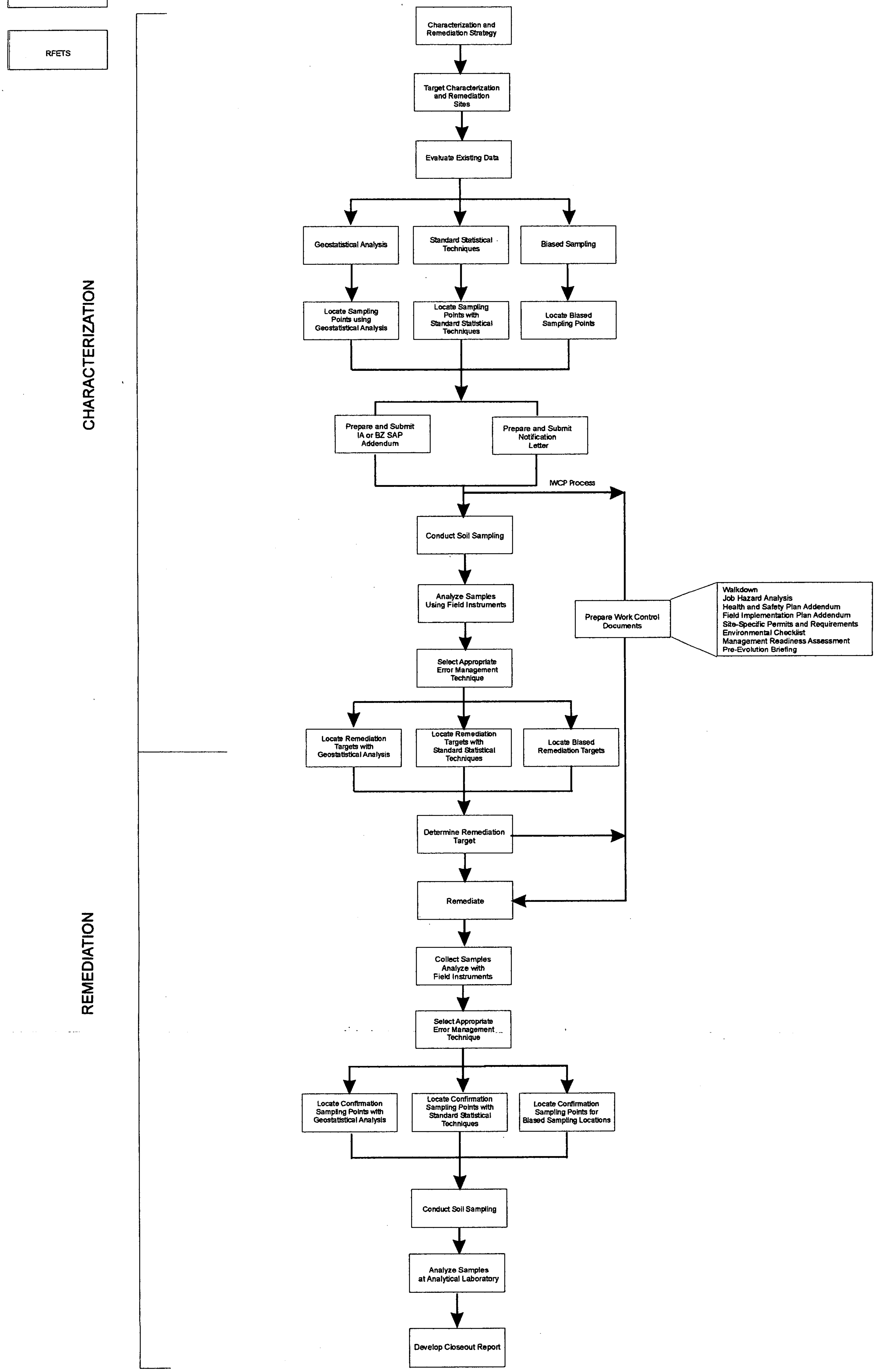
Figure 1
Draft ER RSOP
Overall Accelerated Action Process



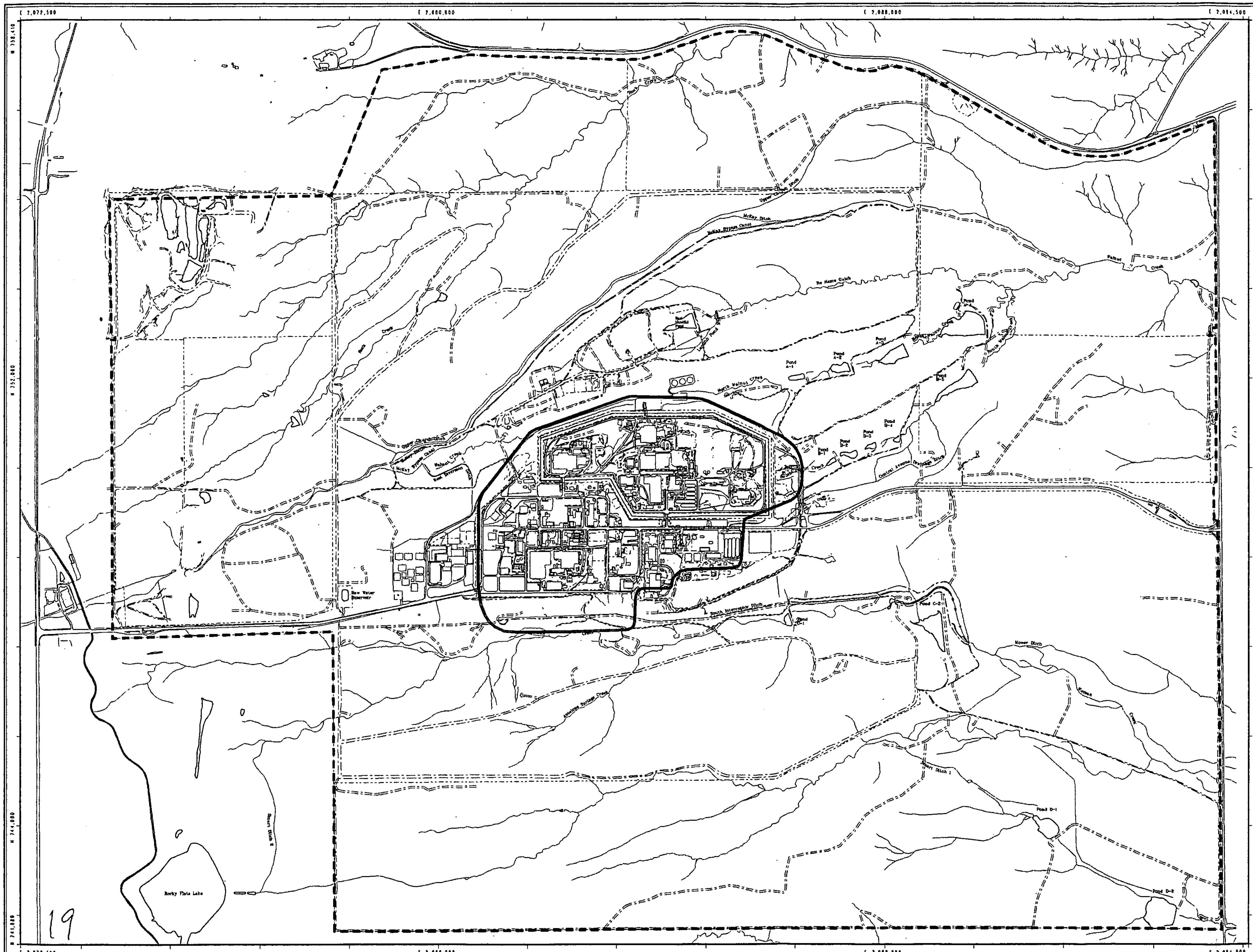


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Figure 2

Rocky Flats Environmental Technology Site

EXPLANATION

Industrial Area Boundary

Buffer Zone Boundary

Standard Map Features

Buildings and other structures

Lakes and ponds

Streams, ditches, or other drainage features

Fences and other barriers

Paved roads

Dirt roads

DATA SOURCE BASE FEATURES:

Buildings, fences, hydrography, roads and other structures from 1994 aerial fly-over data captured by EG&G RSL, Las Vegas. Digitized from the orthophotographs. 1/95

Data Source:
Industrial Area Boundary data - Approved by Nick Demos (RMRS, 303-966-4605).

Scale = 1 : 21430
1 inch represents approximately 1786 feet

500 0 1000 2000ft

State Plane Coordinate Projection
Colorado Central Zone
Datum: NAD27

U.S. Department of Energy
Rocky Flats Environmental Technology Site

GIS Dept. 303-966-7707

Prepared by:
DynCorp
THE ART OF TECHNOLOGY

Prepared for:
KAISER-HILL COMPANY

MAP ID: 2k-0336/ia site fig2.aml

May 22, 2001

NT_Svr w:/projects/fy2k/2k-0336/ia_site_fig2.aml

5

Figure 6
Decision Framework for Soil Accelerated Actions

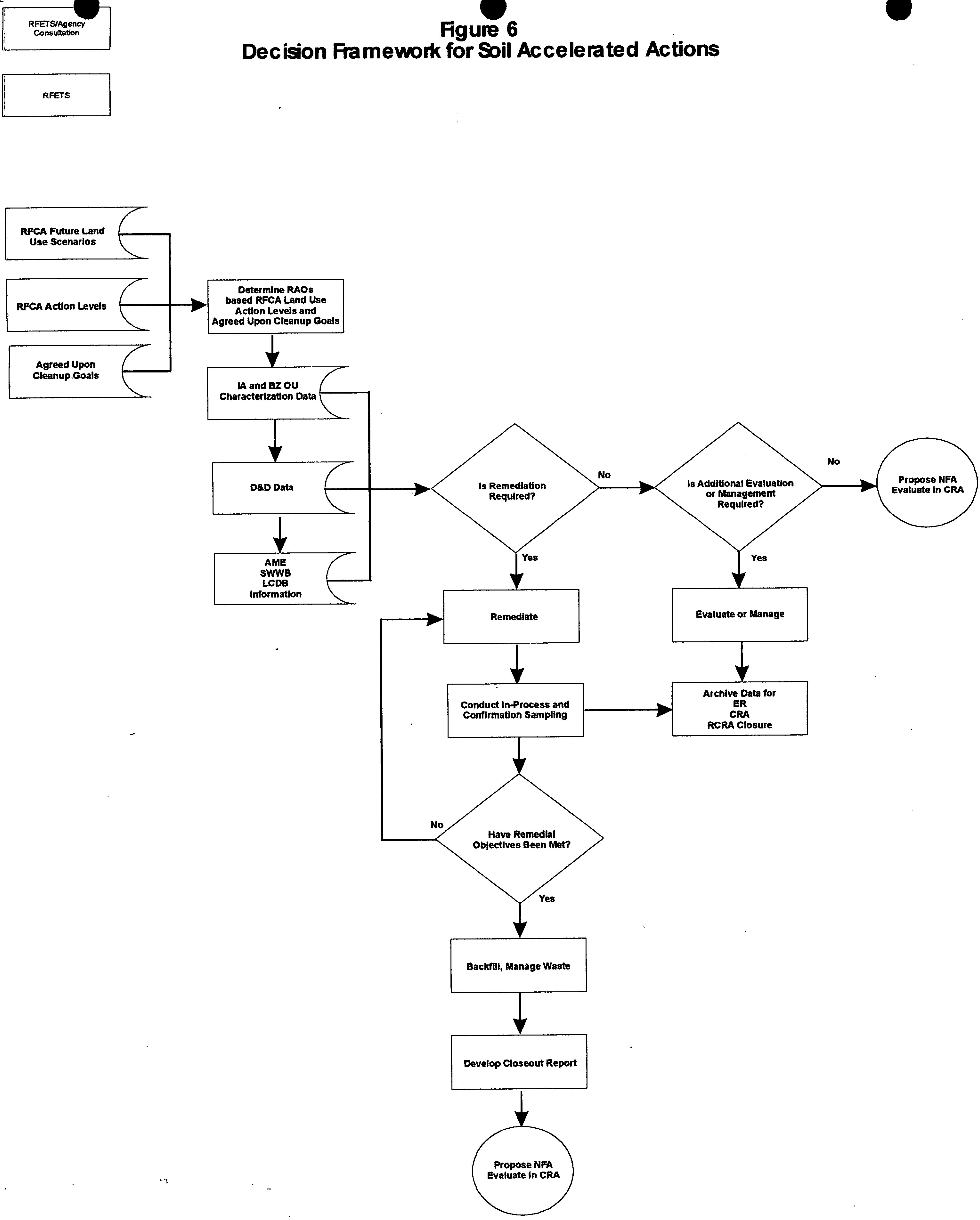

Figure 7
Draft ER RSOP
Data Quality Objectives

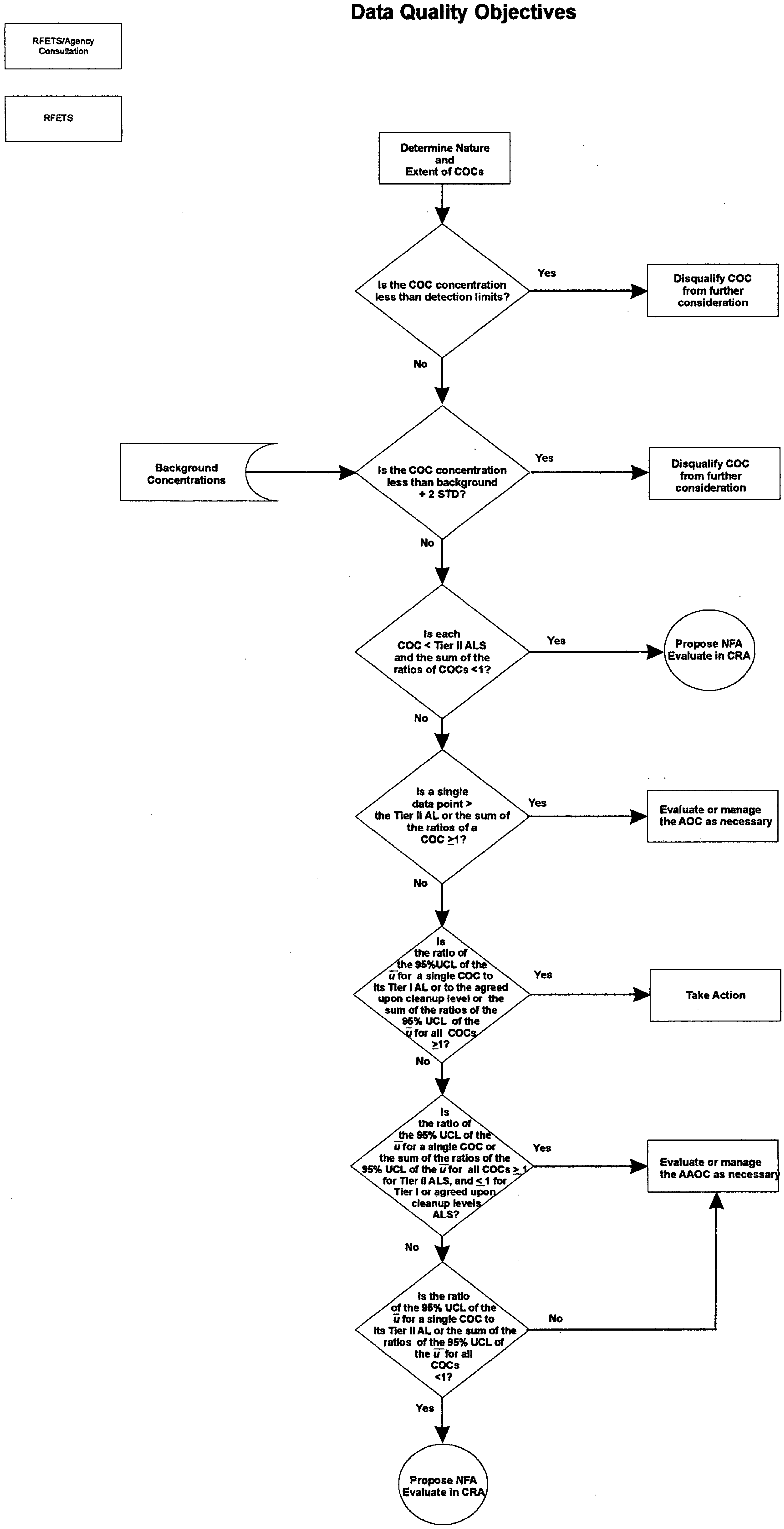

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Figure 9
Draft ER RSOP
Soil Accelerated Action Decision Flow Diagram

RFETS/Agency Consultation

RFETS

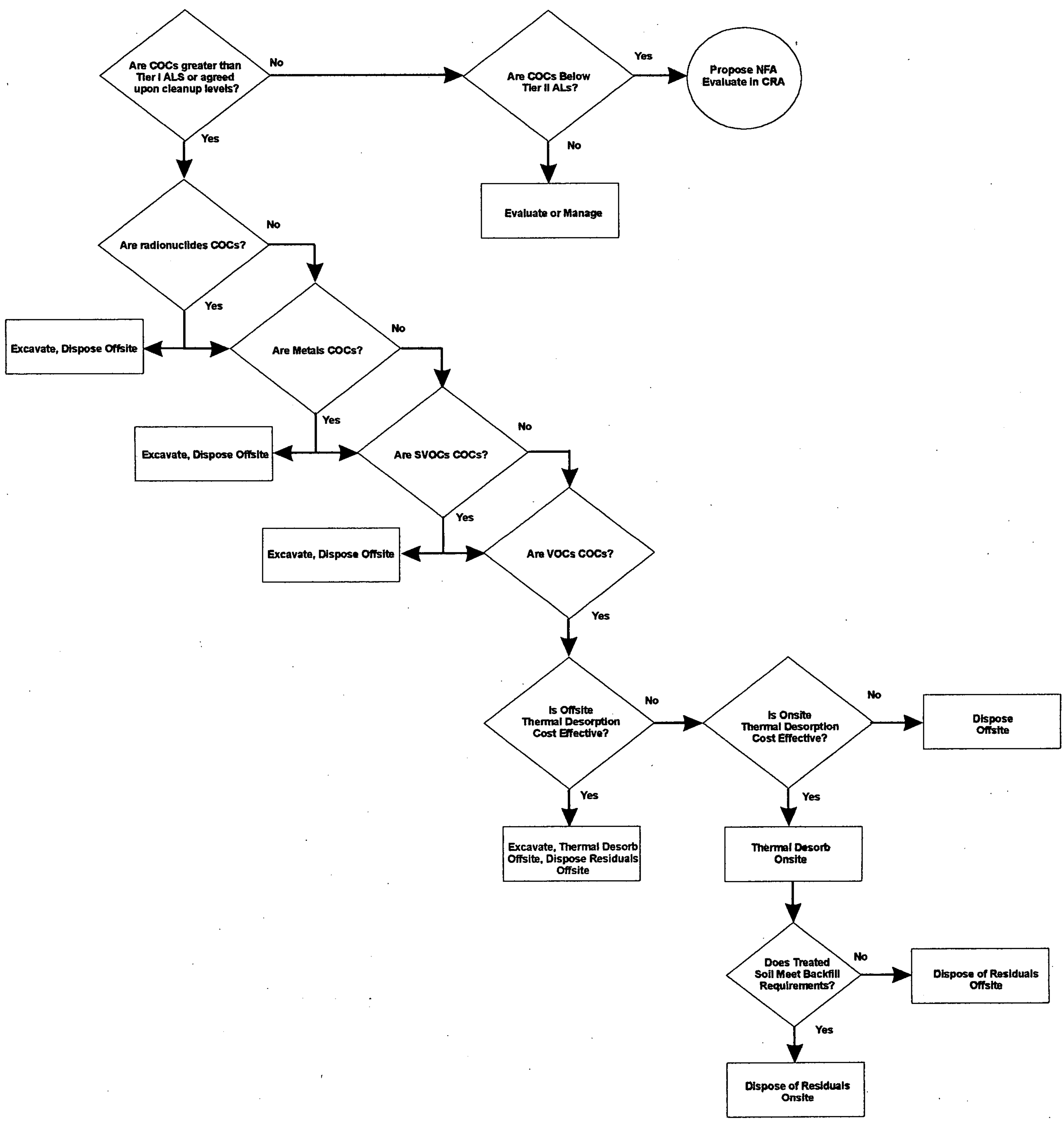
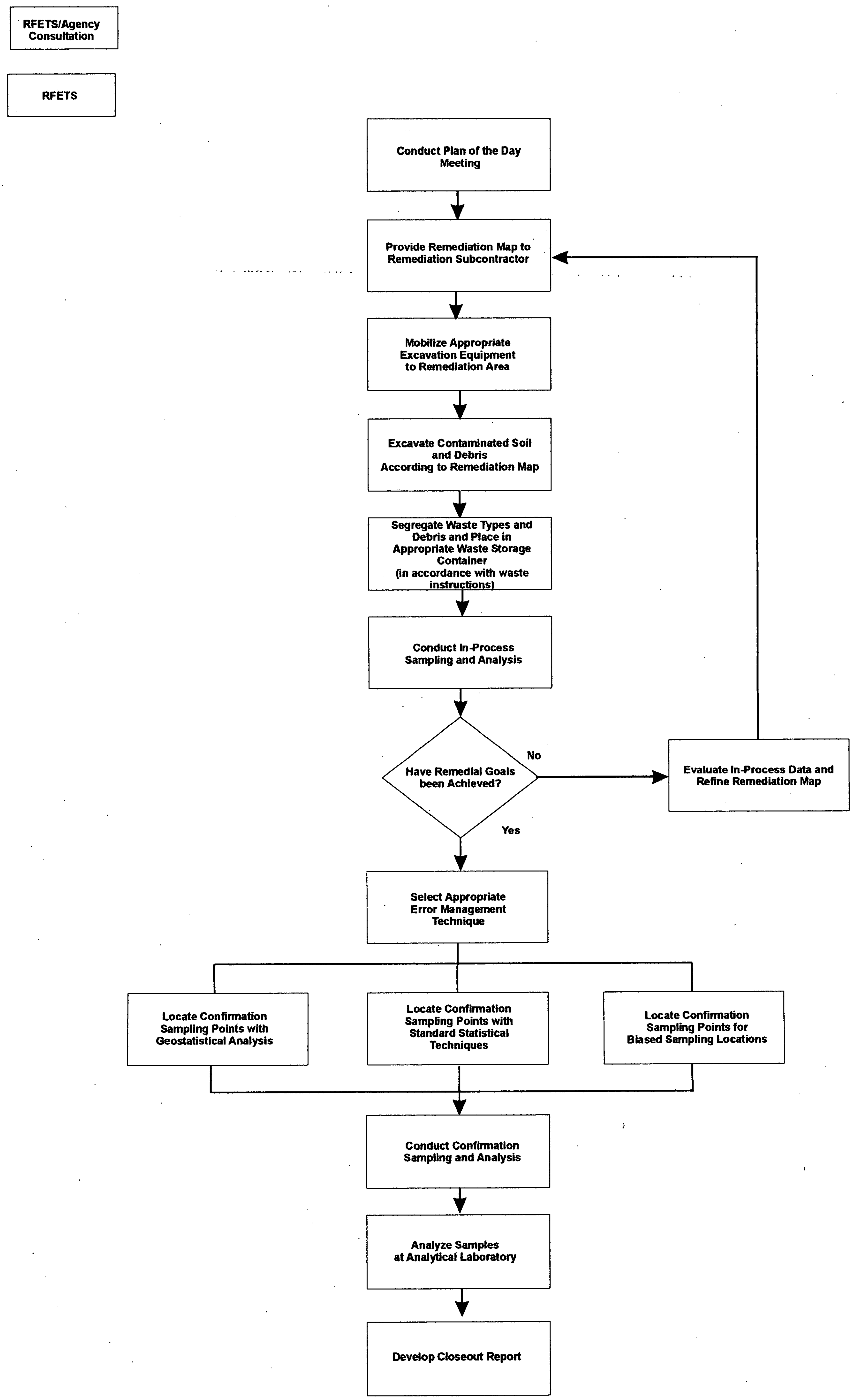


Figure 10
Draft ER RSOP
Detailed Accelerated Action Process



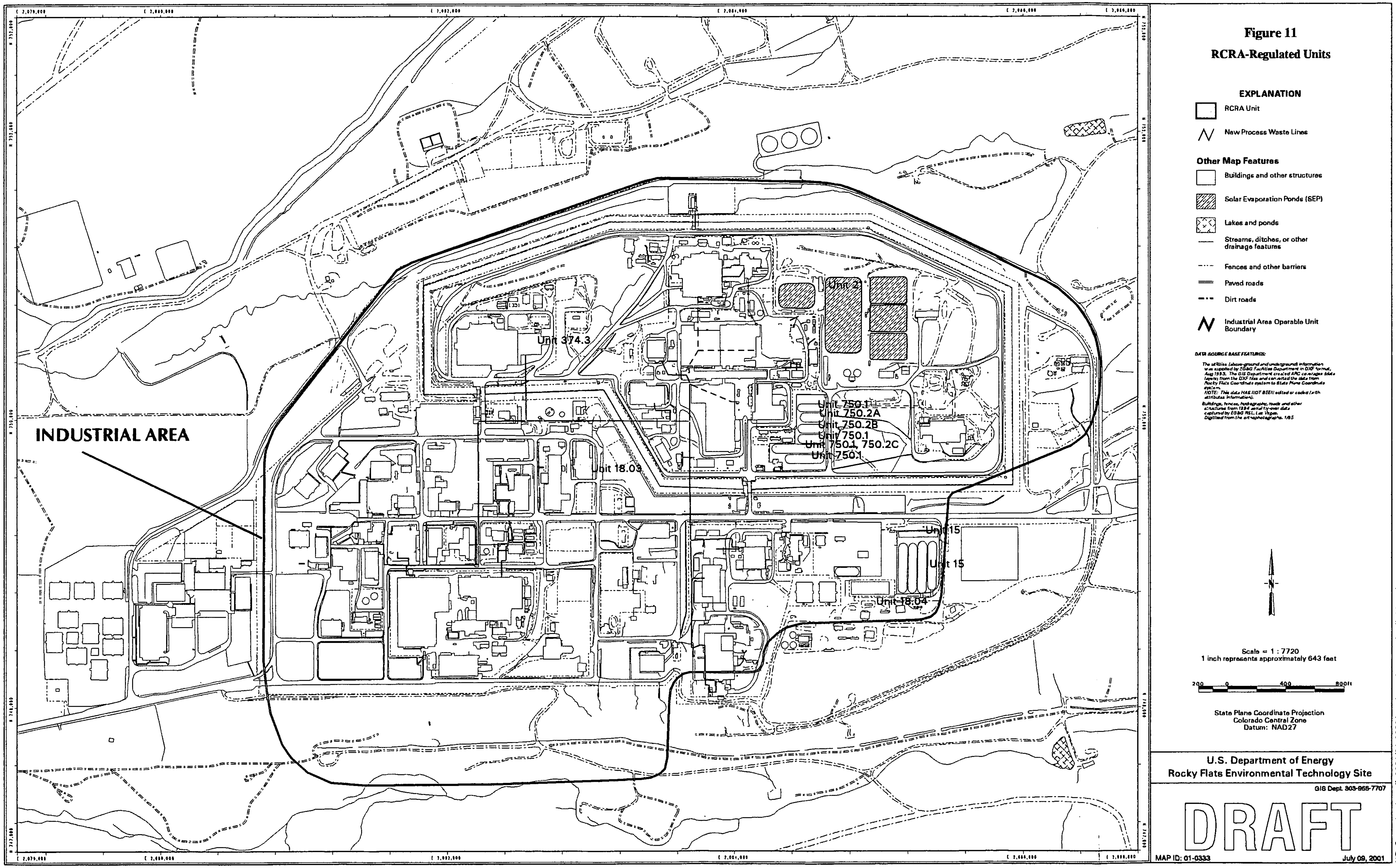


Figure 11
RCRA-Regulated Units

NT_Svr w:/projects/fy2001/01-0333/npwl_opwl_rcra_units_fig11.aml

65

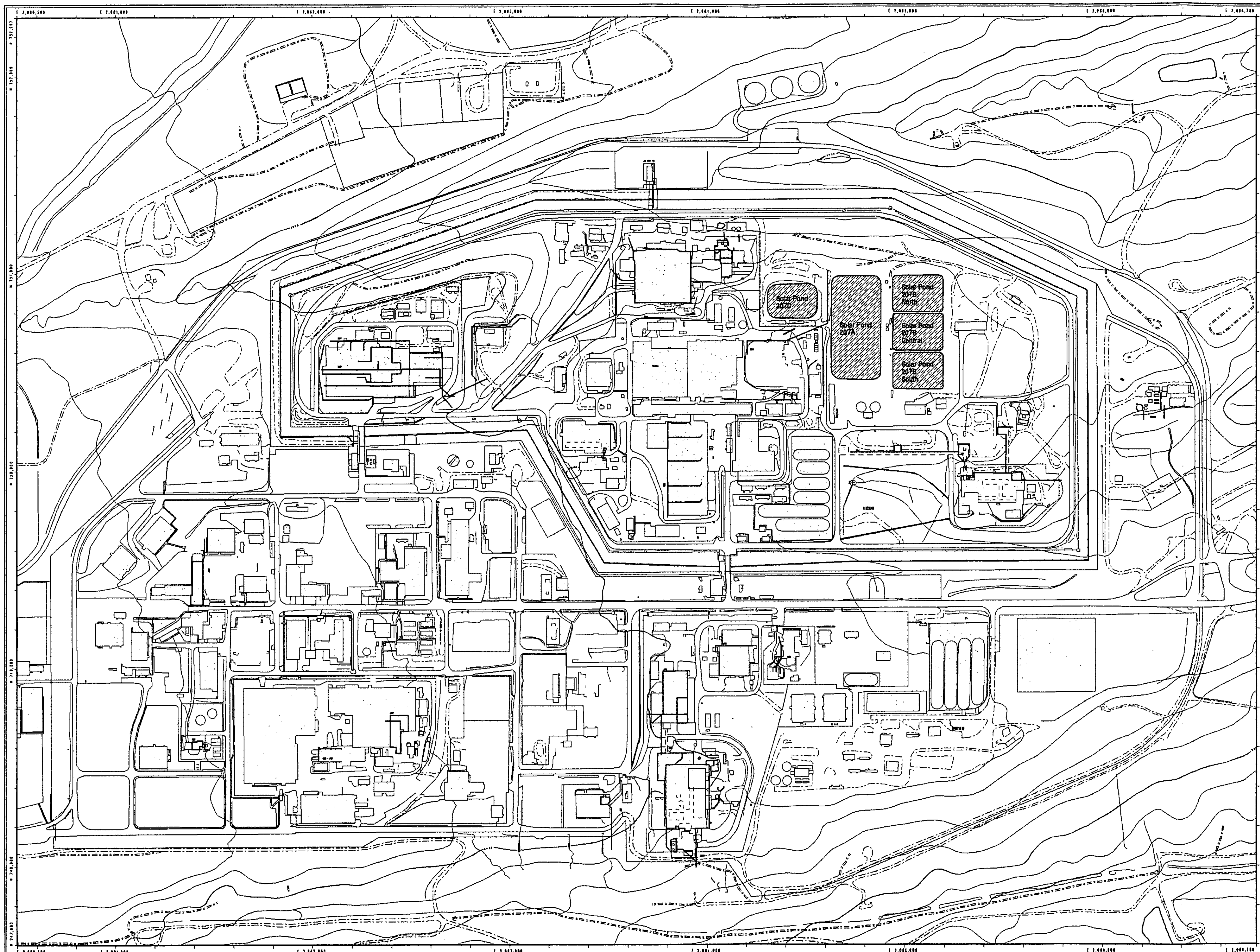


Figure 15
Foundation Drains

EXPLANATION

Foundation Drain

Standard Map Features

- Underground structures
- Buildings and other structures
- Demolished buildings
- Solar Evaporation Ponds (SEP)
- Lakes and ponds
- Streams, ditches, or other drainage features
- Fences and other barriers
- Topographic Contour (20-Foot)
- Paved roads
- Dirt roads

DATA SOURCE BASE FEATURES:
All Potentimetric Contours and Groundwater Wells were generated by the RMRS Groundwater Program.

Point of Contact:
Singer Stephen H, RMRS
ph:(303)966-3387
pg:(303)212-6255
Trailer T130C Rm 107

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NOTE:
Subject Matter Expert:
Water Operations Mngr.
Stephen H Singer
RMRS T130C 107
steve.singer@rfets.gov
Phone: (303)966-3387
Pager: (303)212-6255

Scale = 1 : 6060
1 inch represents 505 feet

100 0 200 400ft

State Plane Coordinate Projection
Colorado Central Zone
Datum: NAD27

U.S. Department of Energy
Rocky Flats Environmental Technology Site

GIS Dept. 303-966-7707

DRAFT

MAP ID: 01-0204

July 05, 2001

NT_Svr w:/projects/fy2001/01-0204/foundation_drains_fig15.aml

82

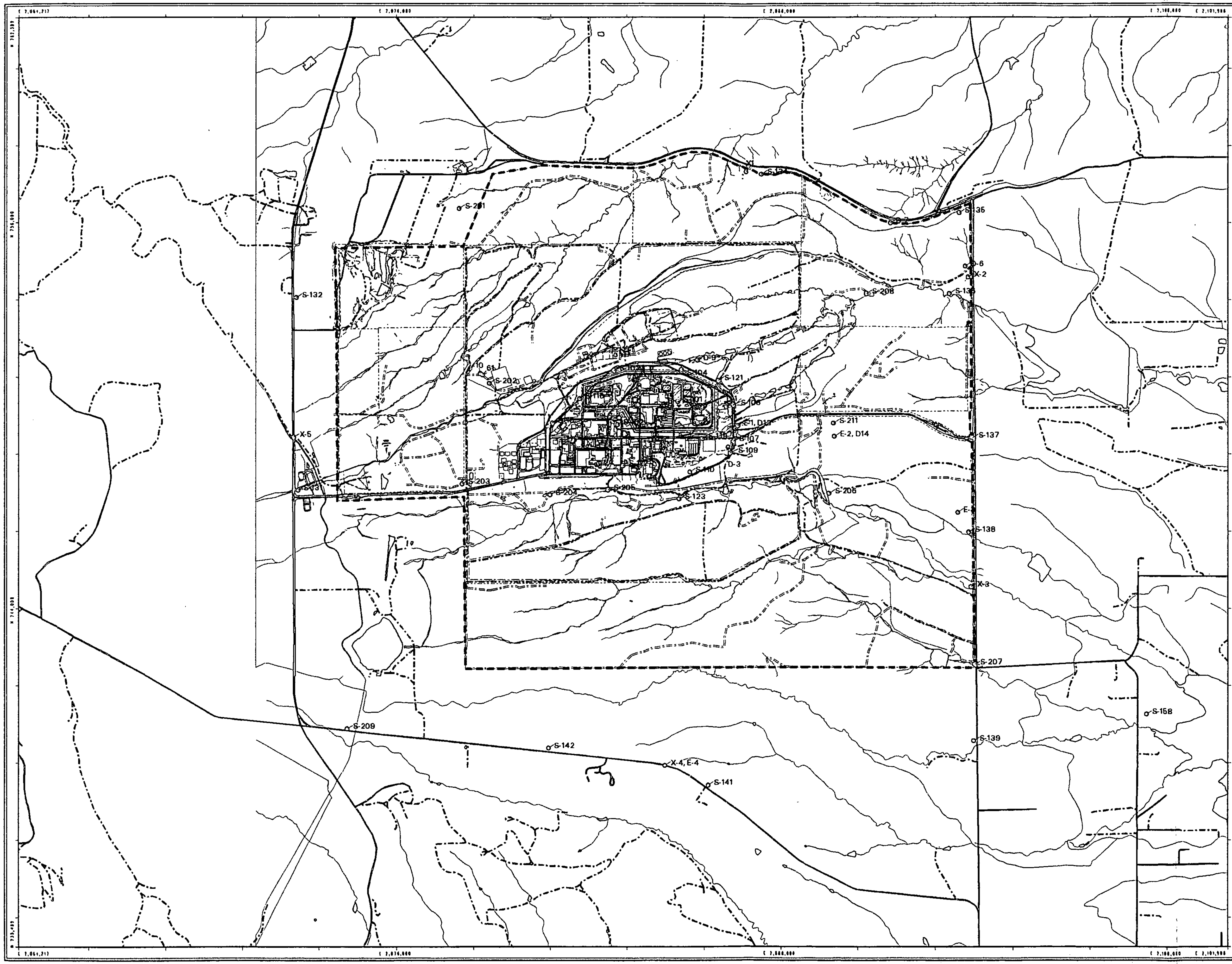

Figure 19

Rocky Flats Environmental Technology Site Air Sampling Location Map

LEGEND

o Air monitoring locations

Standard Map Features

- Buildings and other structures
- Solar Evaporation Ponds (SEP)
- Lakes and ponds
- Streams, ditches, or other drainage features
- Fences and other barriers
- Rocky Flats boundary
- Heavy duty paved roads
- Medium duty paved roads
- Light duty paved roads
- Dirt roads

DATA SOURCE BASE FEATURES:
Buildings, fences, hydrography, roads and other structures from 1994 aerial fly-over data captured by EG&G RSL, Las Vegas. Digitized from the orthophotographs. 1/95

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Scale = 1 : 37290
1 inch represents approximately 3108 feet

700 0 1400 2800ft

State Plane Coordinate Projection
Colorado Central Zone
Datum: NAD27

U.S. Department of Energy
Rocky Flats Environmental Technology Site

GIS Dept. 303-966-7707

Prepared by: DynCorp THE ART OF TECHNOLOGY

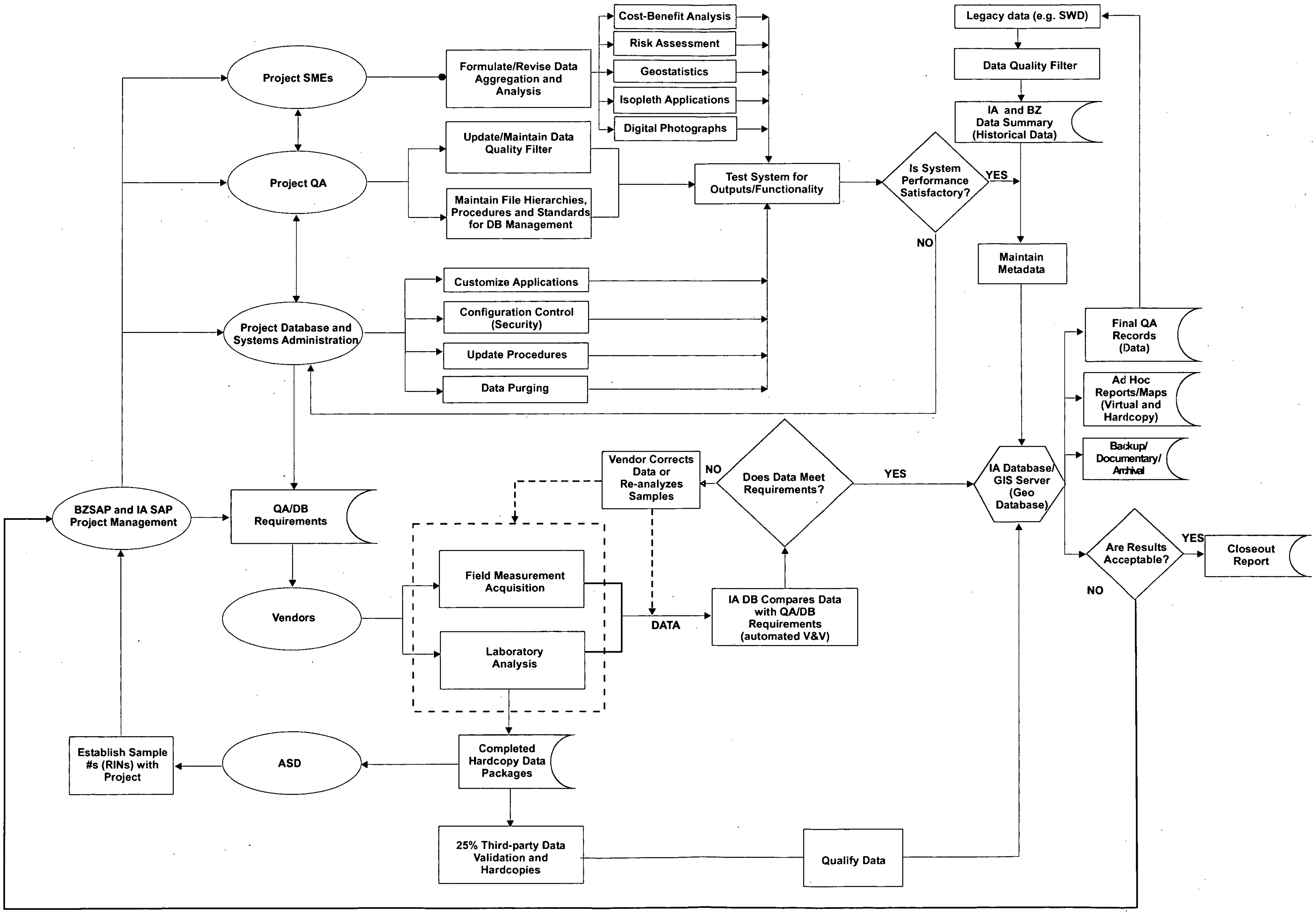
Prepared for: KAISER-HILL COMPANY

MAP ID: 2K-0063 July 03, 2001

Original map contents are preserved. Logo and date have changed.

NT_Svr w:/projects/fy2k/2k-0063/air-sampling/air_sampling_fig19.aml

Figure 20
Draft ER RSOP
Remedial Action Decision Management System Configuration



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SW-A-004355

page 28

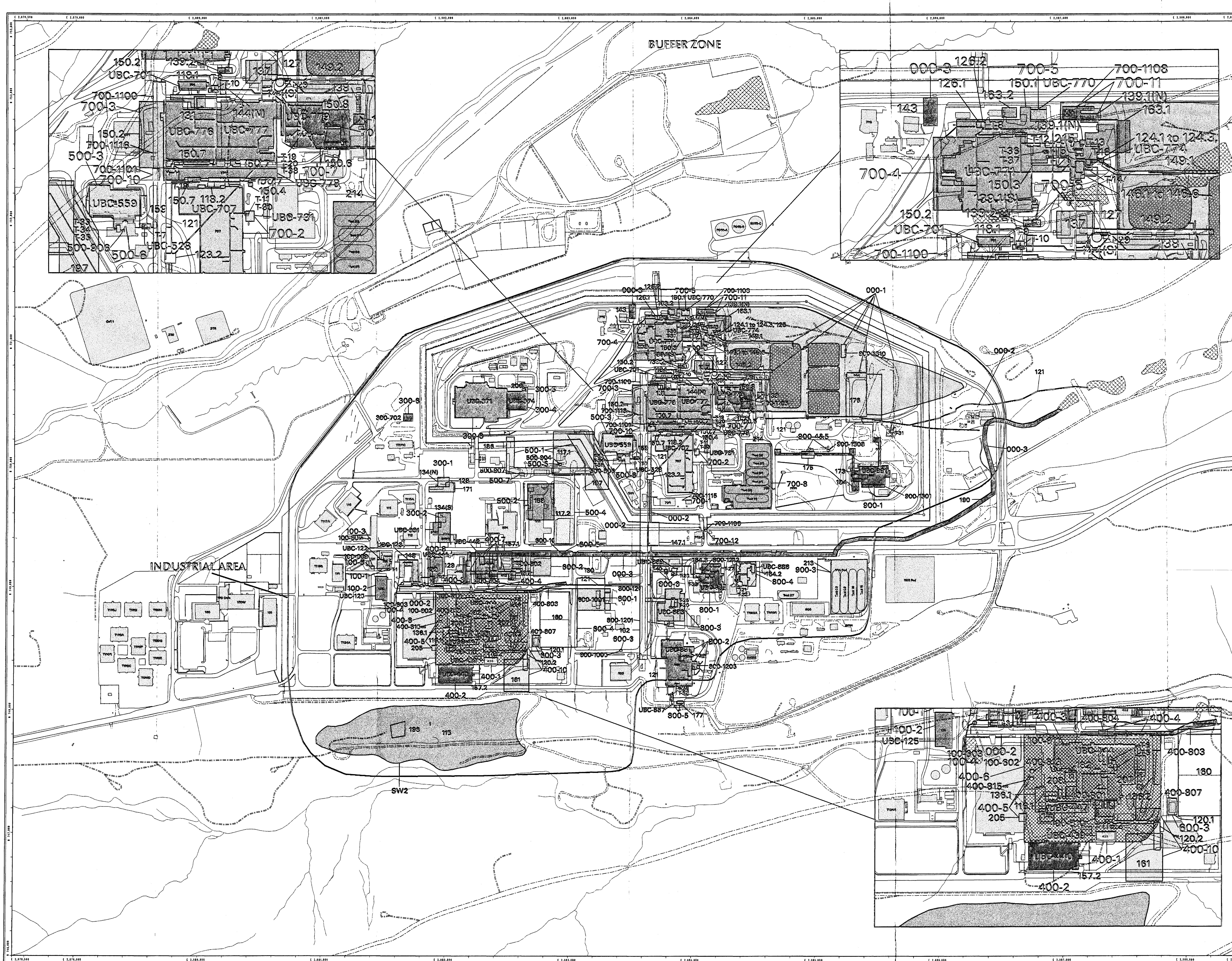


Figure 3

Industrial Area Groups

EXPLANATION

IHSS Groupings

000-1
000-2
000-3
100-1
100-2
100-3
100-4
100-5
300-1
300-2
300-3
300-4
300-5
300-6
400-1
400-2
400-3
400-4
400-5
400-6
400-7
400-8
400-10
500-1
500-2
500-3
500-4
500-5
500-6
500-7
600-1
600-2
600-3
600-4
600-5
600-6
700-1
700-2
700-3
700-4
700-5
700-6
700-7
700-8
700-10
700-11
700-12
800-1
800-2
800-3
800-4
800-5
800-6
900-1
900-3
900-4&5
SW-2

Standard Map Features

Buildings and other structures
Solar Evaporation Ponds (SEP)
Lakes and ponds
Streams, ditches, or other drainage features
Fences and other barriers
Paved roads
Dirt roads
Industrial Area Operable Unit Boundary
Original Process Waste Lines
Location of Original Process Waste Lines that may have been removed.

DATA SOURCE BASE FEATURES:
PACs
Historical Release Report (HRR)
2nd Annual Update
Sept. 30, 1997
Individual Hazardous Substance Sites (IHSS)
DOE, 1992, HRR Report and Subsequent Updates.
Buildings, fences, hydrography, roads and other structures from 1994 aerial fly-over data captured by EG&G RSL, Las Vegas.
Digitized from the orthophotographs. 1/95

Scale = 1 : 3600
1 inch represents 300 feet

100 0 200 400ft

State Plane Coordinate Projection
Colorado Central Zone
Datum: NAD27

U.S. Department of Energy
Rocky Flats Environmental Technology Site

GIS Dept. 303-966-7707

Prepared by:
DynCorp
THE ART OF TECHNOLOGY

Prepared for:
KAISER•HILL COMPANY

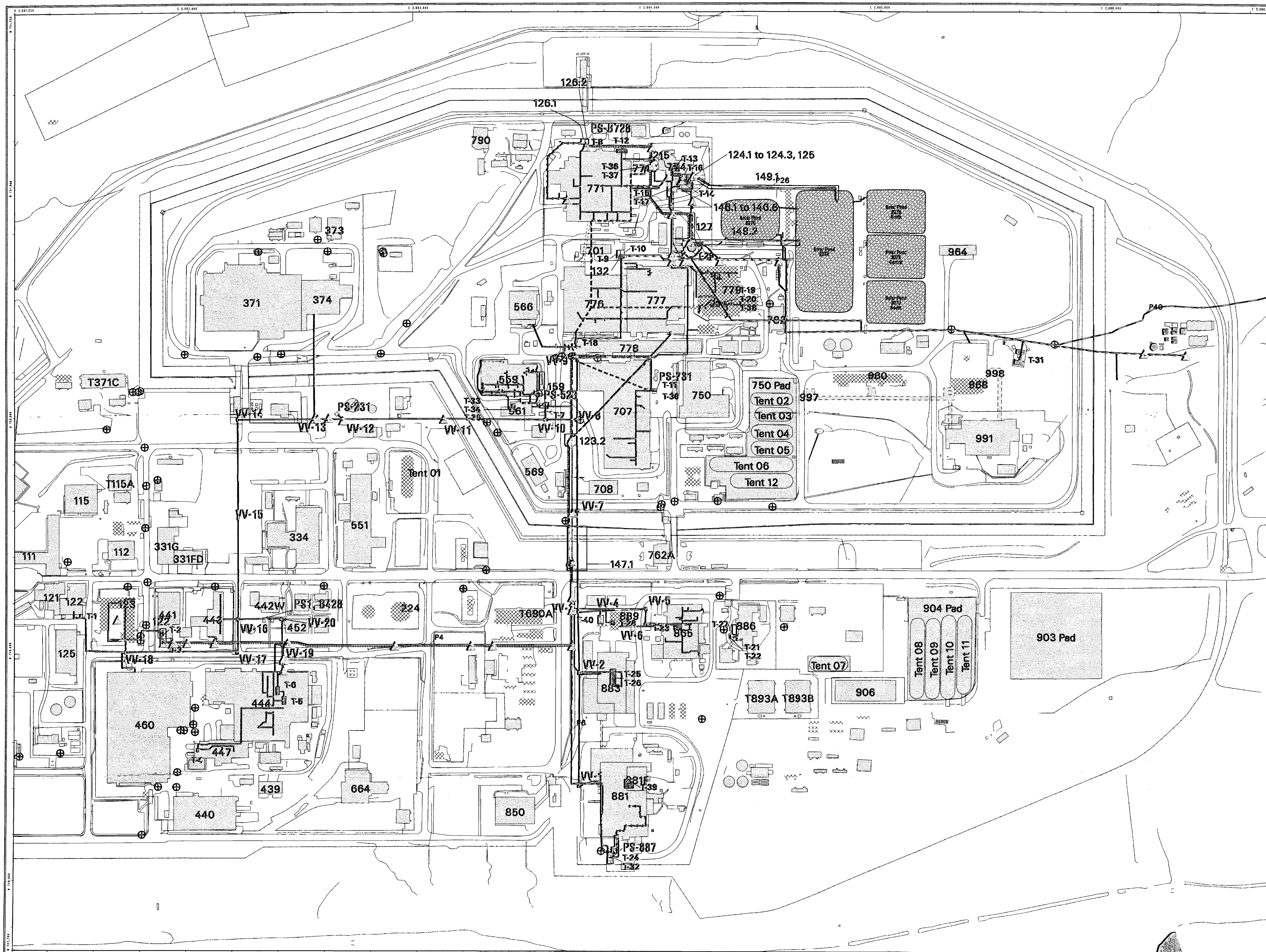
MAP ID: 01-0698

July 05, 2001

Original map contents are preserved. Logo and date have changed.

SW-A-004355

pg. 70



*** Draft ***

Figure 12
Original Process Waste Lines

EXPLANATION

- Tanks of Concern
- Foamed and Stabilized Tanks (Source Removed - Interim Status)
- Remaining Tanks
- Process Waste IHSS Locations (Former OU 9 IHSSs)
- Original Process Waste Lines
- Location of Original Process Waste Lines that may have been removed
- Pipe Currently in Use
- Pipe Made of Vitrified Clay
- Cannot Verify if Pipe Exists
- Leaks Along the Pipe
- Pipe Failed Pressure Test
- Known Leaks
- Manholes
- Approximate Location of New Process Waste Lines
- Valve Vault Locations

NOTE:

VV = Valve Vault
PS = Pumping Station

The Original and New Process Waste Line locations shown on map are approximate and should not be used for determining the line location when performing excavation work.

Standard Map Features

- Buildings and other structures
- Demolished buildings
- Solar Evaporation Ponds (SEP)
- Lakes and ponds
- Streams, ditches, or other drainage features
- Fences and other barriers
- Paved roads
- Underground tunnels

DATA SOURCE BASE FEATURES:
Individual Hazardous Substance Sites (IHSSs) DOE, 1992, HRR Report and Subsequent Updates.
The GIS Original Process Waste Lines (OPWL) were derived from AutoCAD files which were generated by IT Corporation from the OU-9 Work Plan, Nov. 1992
The GIS tanks associated with the Original Process Waste Lines (OPWL) were derived from DXF files which were generated by IT Corporation from the OU-9 Workplan, Feb. 1993.
Buildings, fences, hydrography, roads and other structures from 1994 aerial fly-over data captured by EG&G RSL, Las Vegas. Digitized from the orthophotographs. 1/95

Scale = 1 : 2460
1 inch represents 205 feet

100 0 200 400ft

State Plane Coordinate Projection
Colorado Central Zone
Datum: NAD27

U.S. Department of Energy
Rocky Flats Environmental Technology Site

GIS Dept. 303-966-7707

Prepared by: DynCorp THE ART OF TECHNOLOGY

Prepared for: KAISER•HILL COMPANY

MAP ID: 01-0698

July 05, 2001

NT_Svr c:/projects/fy2001/01-0698/opwl_fig12.aml

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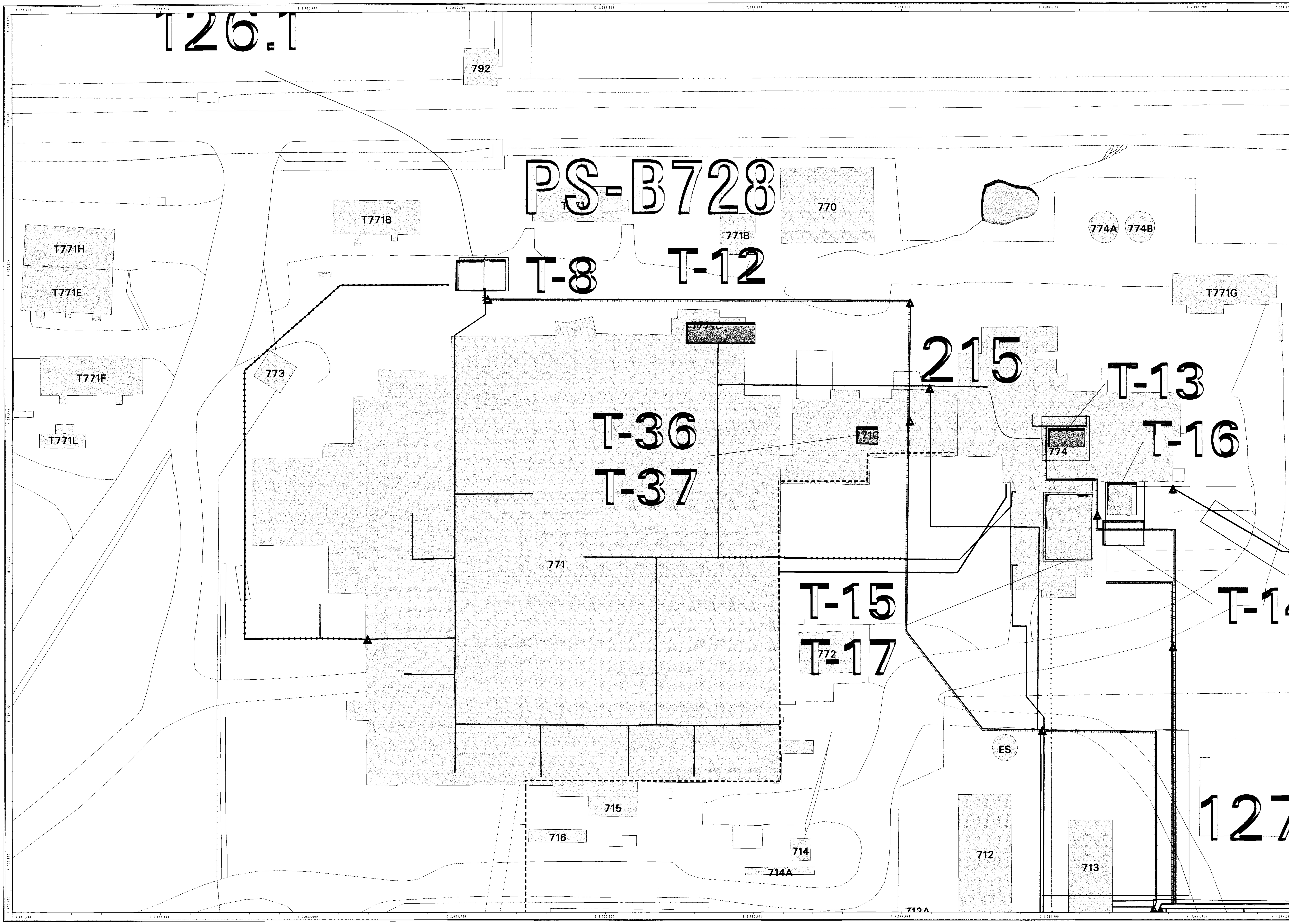
Figure 13-A
Original Process Waste Lines



EXPLANATION

- Tanks of Concern
- Foamed and Stabilized Tanks (Source Removed - Interim Status)
- Remaining Tanks
- Process Waste IHSS Locations (Former OU 9 IHSSs)
- Original Process Waste Lines
- Location of Original Process Waste Lines that may have been removed
- Pipe Currently in Use
- Pipe Made of Vitrified Clay
- Cannot Verify if Pipe Exists
- Leaks Along the Pipe
- Pipe Failed Pressure Test
- Known Leaks
- Manholes
- Approximate Location of New Process Waste Lines
- Valve Vault Locations

NOTE:

VV = Valve Vault
PS = Pumping Station

The Original and New Process Waste Line locations shown on map are approximate and should not be used for determining the line location when performing excavation work.

Standard Map Features

- Buildings and other structures
- Demolished buildings
- Solar Evaporation Ponds (SEP)
- Lakes and ponds
- Streams, ditches, or other drainage features
- Fences and other barriers
- Paved roads
- Underground tunnels

DATA SOURCE BASE FEATURES:

Individual Hazardous Substance Sites (IHSSs) DOE, 1992, HRR Report and Subsequent Updates.

The GIS Original Process Waste Lines (OPWL) were derived from AutoCAD files which were generated by IT Corporation from the OU-9 Work Plan, Nov. 1992

The GIS tanks associated with the Original Process Waste Lines (OPWL) were derived from DXF files which were generated by IT Corporation from the OU-9 Workplan, Feb. 1993.

Buildings, fences, hydrography, roads and other structures from 1994 aerial fly-over data captured by EG&G RSL, Las Vegas. Digitized from the orthophotographs. 1/95

Scale = 1 : 380
1 inch represents approximately 32 feet

10 0 20 40ft

State Plane Coordinate Projection
Colorado Central Zone
Datum: NAD27

U.S. Department of Energy

Rocky Flats Environmental Technology Site

GIS Dept. 303-966-7707

Prepared by: DynCorp THE ART OF TECHNOLOGY

Prepared for: KAISER•HILL COMPANY

MAP ID: 2k-0383

July 04, 2001

NT_Svr o:/projects/fy2001/01-0598/opwl_fig13a_v2.aml

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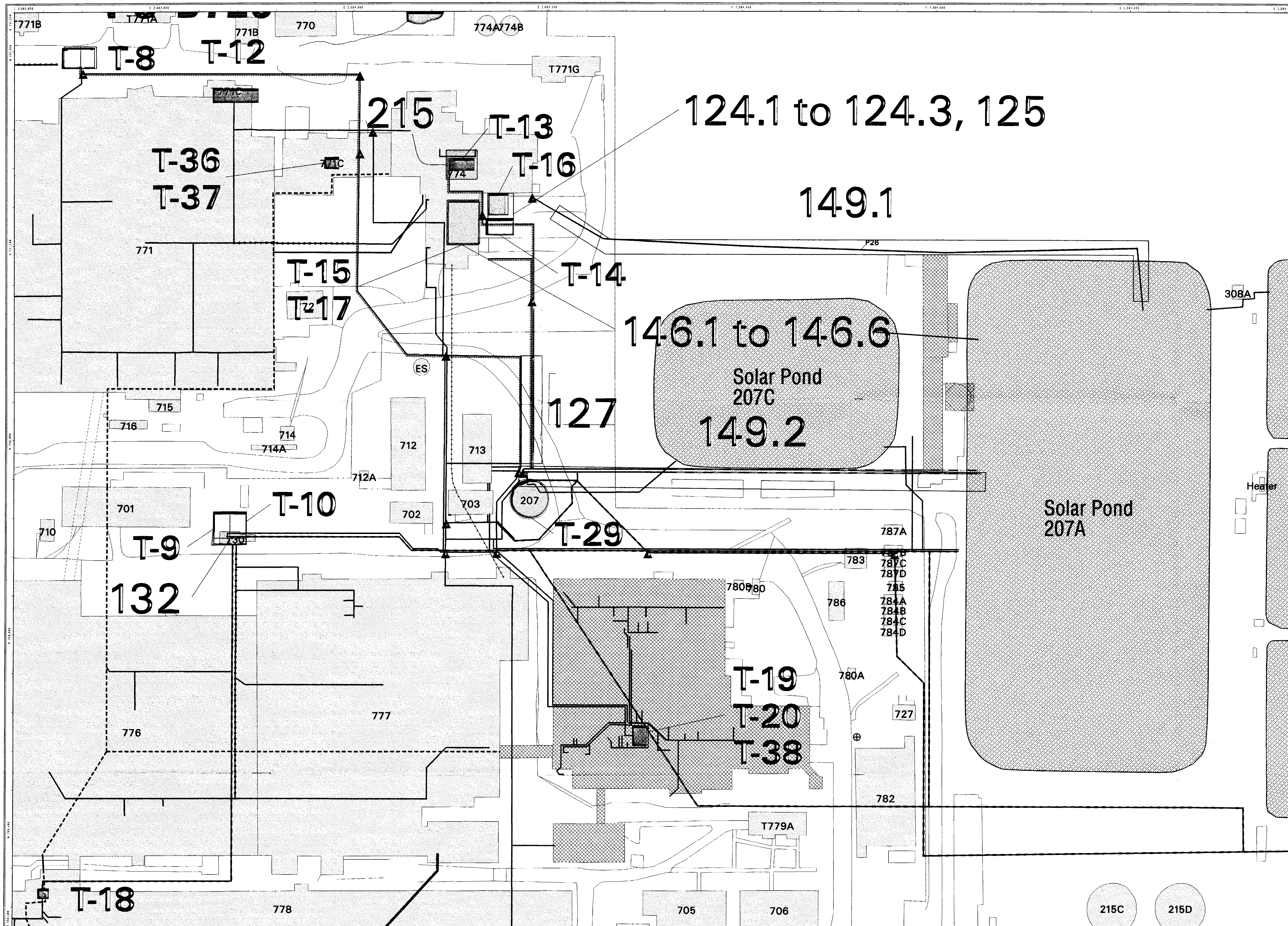

Figure 13-B
Original Process Waste Lines

EXPLANATION

- Tanks of Concern
- Foamed and Stabilized Tanks (Source Removed - Interim Status)
- Remaining Tanks
- Process Waste IHSS Locations (Former OU 9 IHSSs)
- Original Process Waste Lines
- Location of Original Process Waste Lines that may have been removed
- Pipe Currently in Use
- Pipe Made of Vitrified Clay
- Cannot Verify if Pipe Exists
- Leaks Along the Pipe
- Pipe Failed Pressure Test
- Known Leaks
- Manholes
- Approximate Location of New Process Waste Lines
- Valve Vault Locations

NOTE:

VV = Valve Vault
PS = Pumping Station

The Original and New Process Waste Line locations shown on map are approximate and should not be used for determining the line location when performing excavation work.

Standard Map Features

- Buildings and other structures
- Demolished buildings
- Solar Evaporation Ponds (SEP)
- Lakes and ponds
- Streams, ditches, or other drainage features
- Fences and other barriers
- Paved roads
- Underground tunnels

DATA SOURCE BASE FEATURES:

Individual Hazardous Substance Sites (IHSSs) DOE, 1992, HRR Report and Subsequent Updates.

The GIS Original Process Waste Lines (OPWL) were derived from AutoCAD files which were generated by IT Corporation from the OU-9 Work Plan, Nov. 1992

The GIS tanks associated with the Original Process Waste Lines (OPWL) were derived from DXF files which were generated by IT Corporation from the OU-9 Workplan, Feb. 1993.

Buildings, fences, hydrography, roads and other structures from 1994 aerial fly-over data captured by EG&G RSL, Las Vegas. Digitized from the orthophotographs. 1/95

Scale = 1 : 570
1 inch represents approximately 48 feet

25 0 50 100ft

State Plane Coordinate Projection
Colorado Central Zone
Datum: NAD27

U.S. Department of Energy
Rocky Flats Environmental Technology Site

GIS Dept. 303-966-7707

Prepared by:

DynCorp
THE ART OF TECHNOLOGY

Prepared for:

KAISER•HILL COMPANY

MAP ID: 2k-0383

July 04, 2001

NT_Svr o:/projects/fy2001/01-0698/opwl_fig13b_v2.aml

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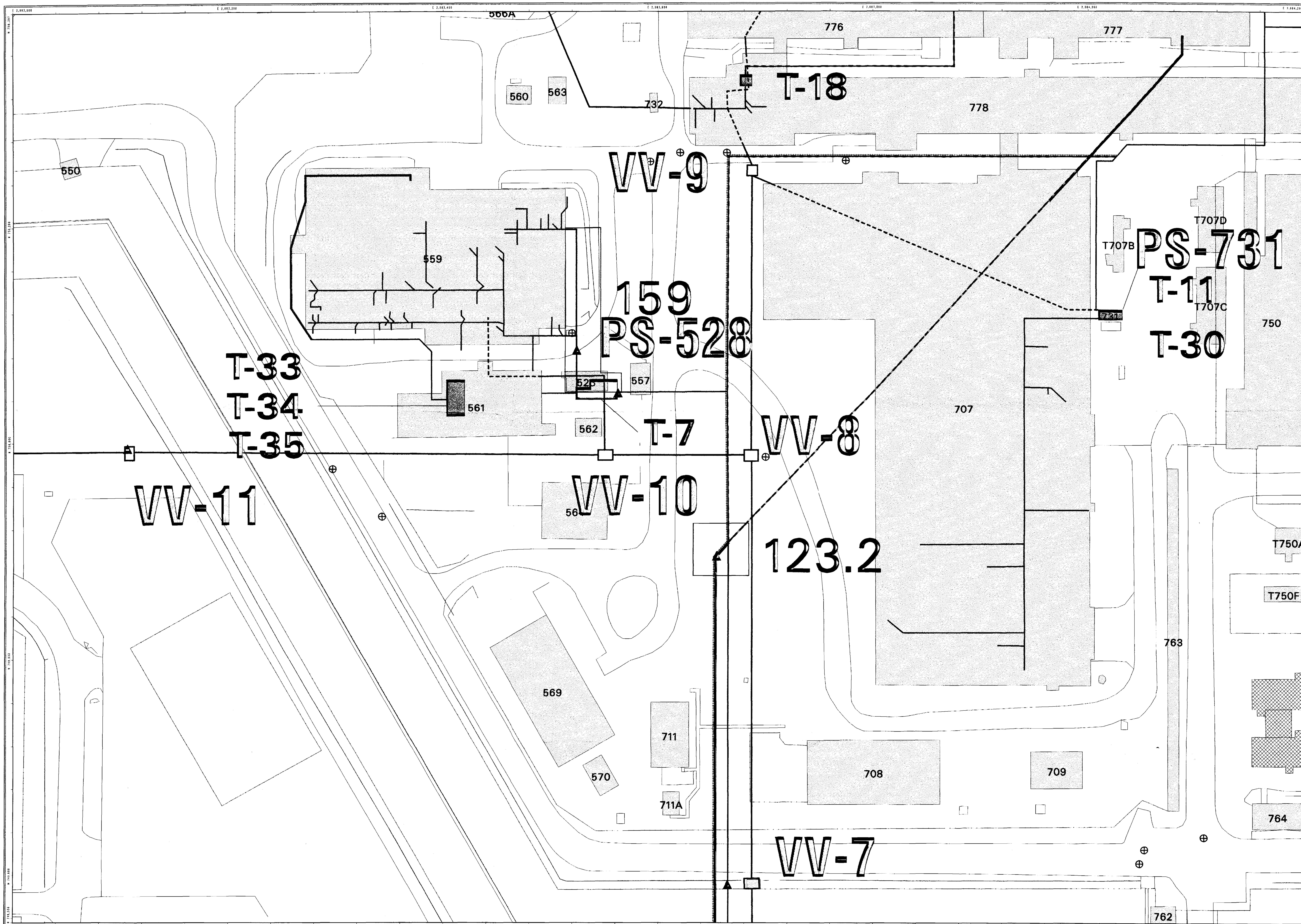
Figure 13-C
Original Process Waste Lines



EXPLANATION

- Tanks of Concern
- Foamed and Stabilized Tanks (Source Removed - Interim Status)
- Remaining Tanks
- Process Waste IHSS Locations (Former OU 9 IHSSs)
- Original Process Waste Lines
- Location of Original Process Waste Lines that may have been removed
- Pipe Currently in Use
- Pipe Made of Vitrified Clay
- Cannot Verify if Pipe Exists
- Leaks Along the Pipe
- Pipe Failed Pressure Test
- Known Leaks
- Manholes
- Approximate Location of New Process Waste Lines
- Valve Vault Locations

NOTE:

VV = Valve Vault
PS = Pumping Station

The Original and New Process Waste Line locations shown on map are approximate and should not be used for determining the line location when performing excavation work.

Standard Map Features

- Buildings and other structures
- Demolished buildings
- Solar Evaporation Ponds (SEP)
- Lakes and ponds
- Streams, ditches, or other drainage features
- Fences and other barriers
- Paved roads
- Underground tunnels

DATA SOURCE BASE FEATURES:

Individual Hazardous Substance Sites (IHSSs) DOE, 1992, HRR Report and Subsequent Updates.

The GIS Original Process Waste Lines (OPWL) were derived from AutoCAD files which were generated by IT Corporation from the OU-9 Work Plan, Nov. 1992

The GIS tanks associated with the Original Process Waste Lines (OPWL) were derived from DXF files which were generated by IT Corporation from the OU-9 Workplan, Feb. 1993.

Buildings, fences, hydrography, roads and other structures from 1994 aerial fly-over data captured by EG&G RSL, Las Vegas. Digitized from the orthophotographs. 1/95

Scale = 1 : 520
1 inch represents approximately 43 feet

25 0 50 100ft

State Plane Coordinate Projection
Colorado Central Zone
Datum: NAD27

U.S. Department of Energy

Rocky Flats Environmental Technology Site

GIS Dept. 303-966-7707

Prepared by:

DynCorp
THE ART OF TECHNOLOGY

Prepared for:

KAISER•HILL COMPANY

MAP ID: 2k-0383

July 04, 2001

NT_Svr o:/projects/fy2001/01-0698/opwl_fig13c_v2.aml

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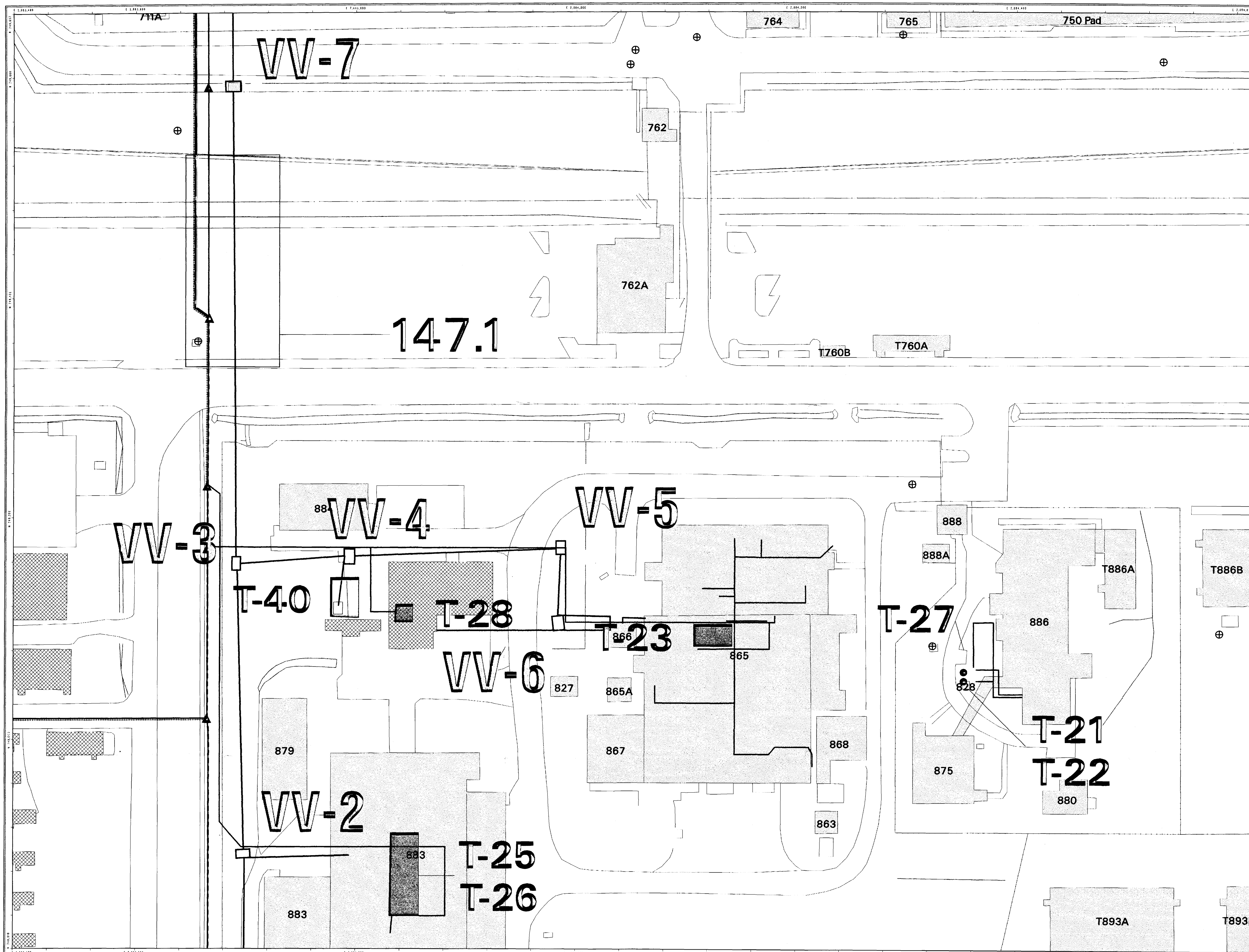

Figure 13-D
Original Process Waste Lines

EXPLANATION

- Tanks of Concern
- Foamed and Stabilized Tanks (Source Removed - Interim Status)
- Remaining Tanks
- Process Waste IHSS Locations (Former OU 9 IHSSs)
- Original Process Waste Lines
- Location of Original Process Waste Lines that may have been removed
- Pipe Currently in Use
- Pipe Made of Vitrified Clay
- Cannot Verify if Pipe Exists
- Leaks Along the Pipe
- Pipe Failed Pressure Test
- Known Leaks
- Manholes
- Approximate Location of New Process Waste Lines
- Valve Vault Locations

NOTE:

VV = Valve Vault
PS = Pumping Station

The Original and New Process Waste Line locations shown on map are approximate and should not be used for determining the line location when performing excavation work.

Standard Map Features

- Buildings and other structures
- Demolished buildings
- Solar Evaporation Ponds (SEP)
- Lakes and ponds
- Streams, ditches, or other drainage features
- Fences and other barriers
- Paved roads
- Underground tunnels

DATA SOURCE BASE FEATURES:
Individual Hazardous Substance Sites (IHSSs) DOE, 1992, HRR Report and Subsequent Updates.
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The GIS tanks associated with the Original Process Waste Lines (OPWL) were derived from DXF files which were generated by IT Corporation from the OU-9 Workplan, Feb. 1993.
Buildings, fences, hydrography, roads and other structures from 1994 aerial fly-over data captured by EG&G RSL, Las Vegas. Digitized from the orthophotographs. 1/95

Scale = 1 : 510
1 inch represents approximately 43 feet

20 0 40 80ft

State Plane Coordinate Projection
Colorado Central Zone
Datum: NAD27

U.S. Department of Energy
Rocky Flats Environmental Technology Site

GIS Dept. 303-966-7707

Prepared by:
DynCorp
THE ART OF TECHNOLOGY

Prepared for:
KAISER•HILL COMPANY

MAP ID: 2k-0383

July 04, 2001

NT_Svr o:/projects/fy2001/01-0698/opwl_fig13d_v2.aml

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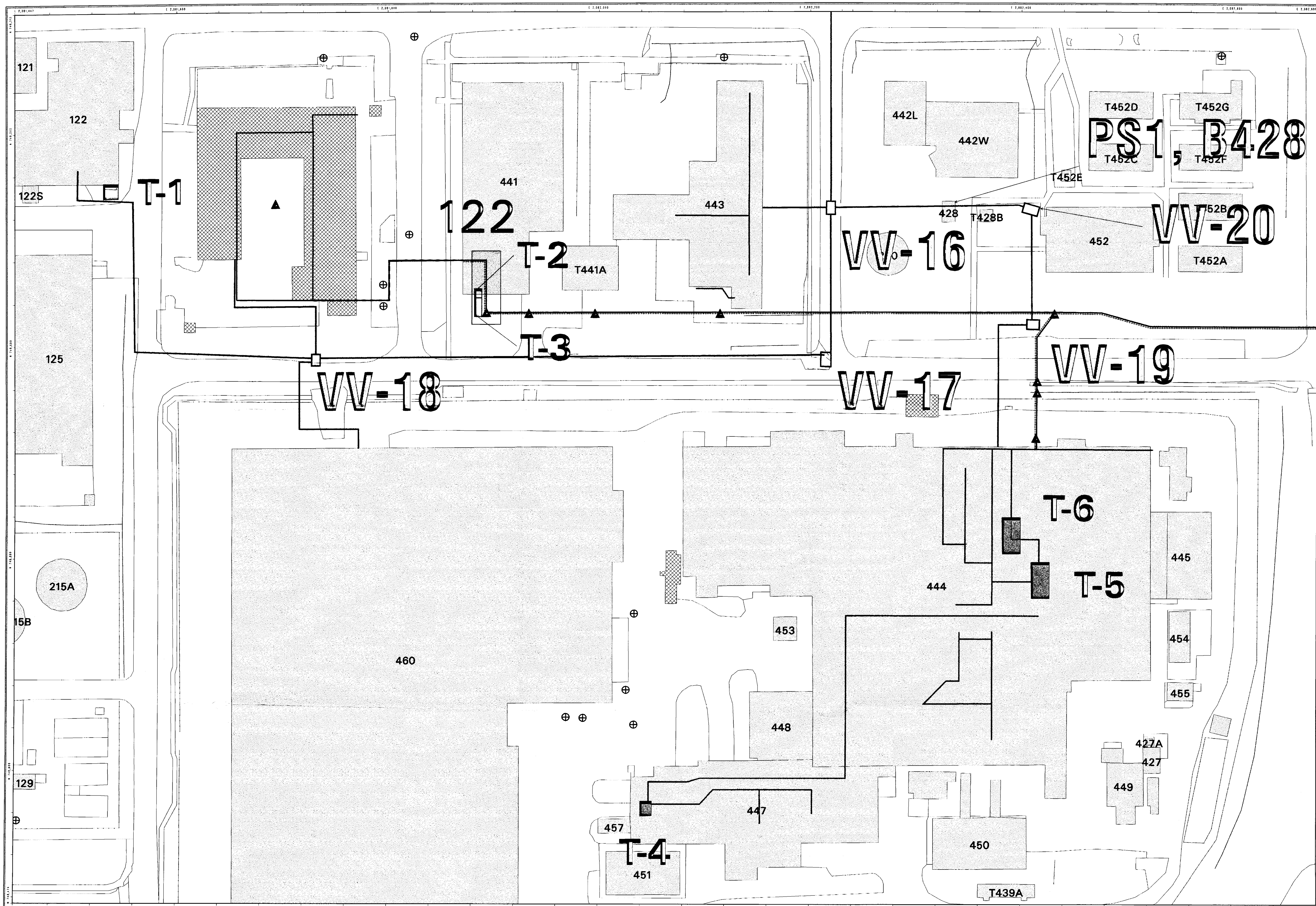
Figure 13-E
Original Process Waste Lines



EXPLANATION

- Tanks of Concern
- Foamed and Stabilized Tanks (Source Removed - Interim Status)
- Remaining Tanks
- Process Waste IHSS Locations (Former OU 9 IHSSs)
- Original Process Waste Lines
- Location of Original Process Waste Lines that may have been removed
- Pipe Currently in Use
- Pipe Made of Vitrified Clay
- Cannot Verify if Pipe Exists
- Leaks Along the Pipe
- Pipe Failed Pressure Test
- Known Leaks
- Manholes
- Approximate Location of New Process Waste Lines
- Valve Vault Locations

NOTE:

VV = Valve Vault
PS = Pumping Station

The Original and New Process Waste Line locations shown on map are approximate and should not be used for determining the line location when performing excavation work.

Standard Map Features

- Buildings and other structures
- Demolished buildings
- Solar Evaporation Ponds (SEP)
- Lakes and ponds
- Streams, ditches, or other drainage features
- Fences and other barriers
- Paved roads
- Underground tunnels

DATA SOURCE BASE FEATURES:
Individual Hazardous Substance Sites (IHSSs) DOE, 1992, HRR Report and Subsequent Updates.
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The GIS tanks associated with the Original Process Waste Lines (OPWL) were derived from DXF files which were generated by IT Corporation from the OU-9 Workplan, Feb. 1993.
Buildings, fences, hydrography, roads and other structures from 1994 aerial fly-over data captured by EG&G RSL, Las Vegas. Digitized from the orthophotographs. 1/95

Scale = 1 : 540
1 inch represents 45 feet

25 0 50 100ft

State Plane Coordinate Projection
Colorado Central Zone
Datum: NAD27

U.S. Department of Energy
Rocky Flats Environmental Technology Site

GIS Dept. 303-966-7707

Prepared by: DynCorp THE ART OF TECHNOLOGY

Prepared for: KAISER•HILL COMPANY

MAP ID: 2k-0383

July 04, 2001

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Figure 13-F
Original Process Waste Lines

EXPLANATION

- Tanks of Concern
- Foamed and Stabilized Tanks (Source Removed - Interim Status)
- Remaining Tanks
- Process Waste IHSS Locations (Former OU 9 IHSSs)
- Original Process Waste Lines
- Location of Original Process Waste Lines that may have been removed
- Pipe Currently in Use
- Pipe Made of Vitrified Clay
- Cannot Verify if Pipe Exists
- Leaks Along the Pipe
- Pipe Failed Pressure Test
- Known Leaks
- Manholes
- Approximate Location of New Process Waste Lines
- Valve Vault Locations

NOTE:

VV = Valve Vault
PS = Pumping Station

The Original and New Process Waste Line locations shown on map are approximate and should not be used for determining the line location when performing excavation work.

Standard Map Features

- Buildings and other structures
- Demolished buildings
- Solar Evaporation Ponds (SEP)
- Lakes and ponds
- Streams, ditches, or other drainage features
- Fences and other barriers
- Paved roads
- Underground tunnels

DATA SOURCE BASE FEATURES:

Individual Hazardous Substance Sites (IHSSs) DOE, 1992, HRR Report and Subsequent Updates.

The GIS Original Process Waste Lines (OPWL) were derived from AutoCAD files which were generated by IT Corporation from the OU-9 Work Plan, Nov. 1992

The GIS tanks associated with the Original Process Waste Lines (OPWL) were derived from DXF files which were generated by IT Corporation from the OU-9 Workplan, Feb. 1993.

Buildings, fences, hydrography, roads and other structures from 1994 aerial fly-over data captured by EG&G RSL, Las Vegas. Digitized from the orthophotographs. 1/95

Scale = 1 : 370
1 inch represents approximately 31 feet

10 0 20 40ft

State Plane Coordinate Projection
Colorado Central Zone
Datum: NAD27

U.S. Department of Energy
Rocky Flats Environmental Technology Site

GIS Dept. 303-966-7707

Prepared by: DynCorp THE ART OF TECHNOLOGY

Prepared for: KAISER•HILL COMPANY

MAP ID: 2k-0383

July 04, 2001

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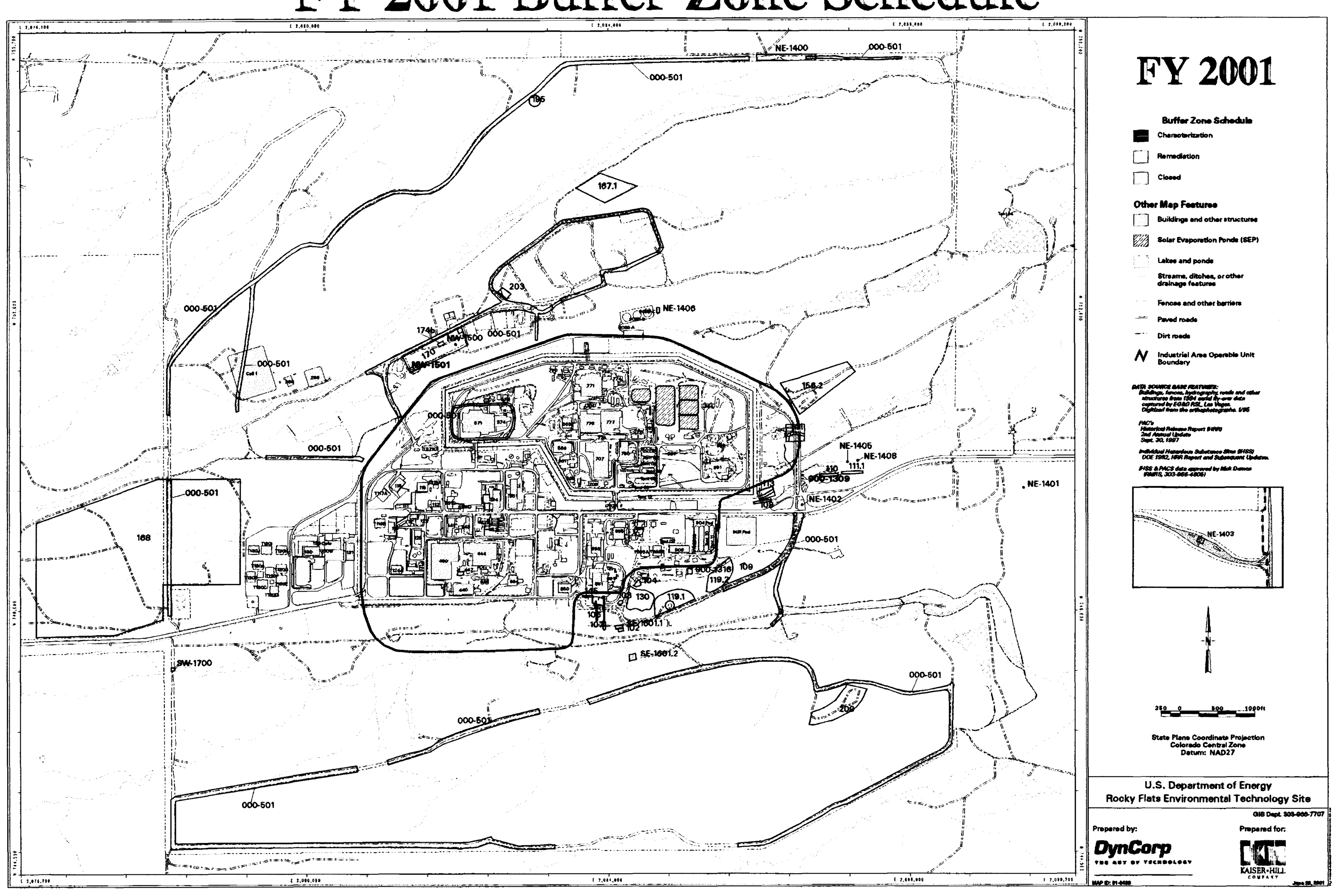
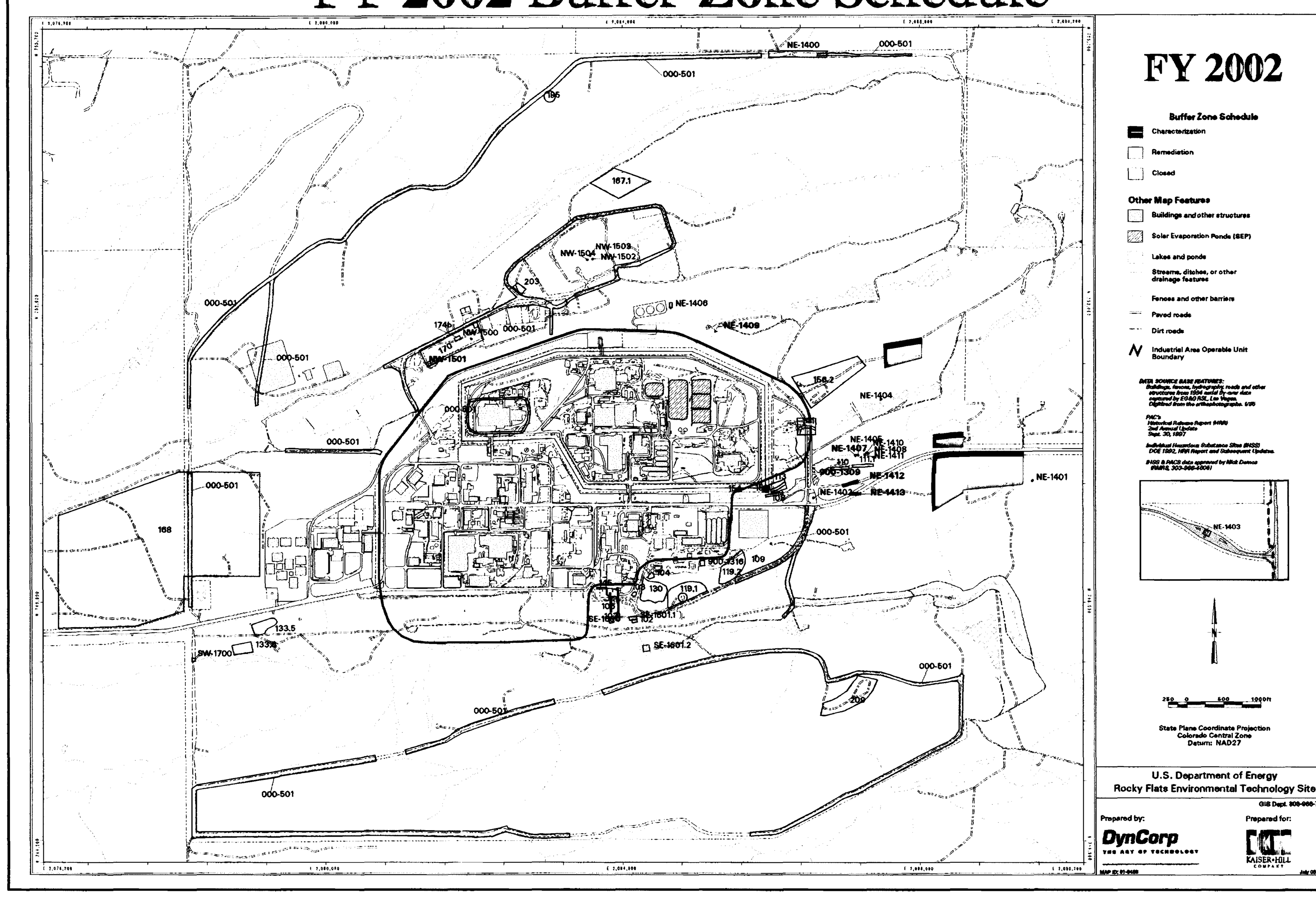
Figure 17
Buffer Zone Schedule

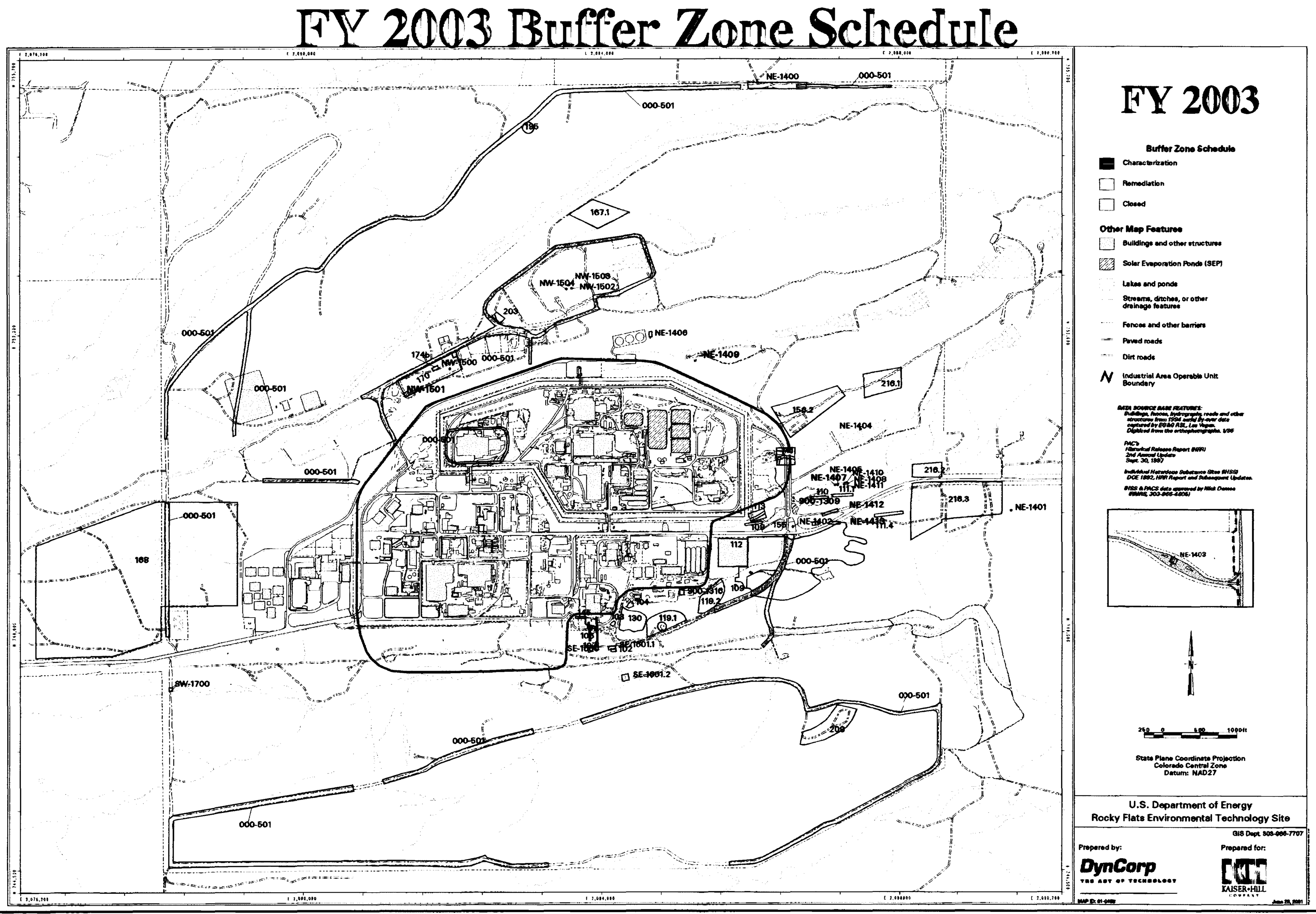
FY 2001 Buffer Zone Schedule



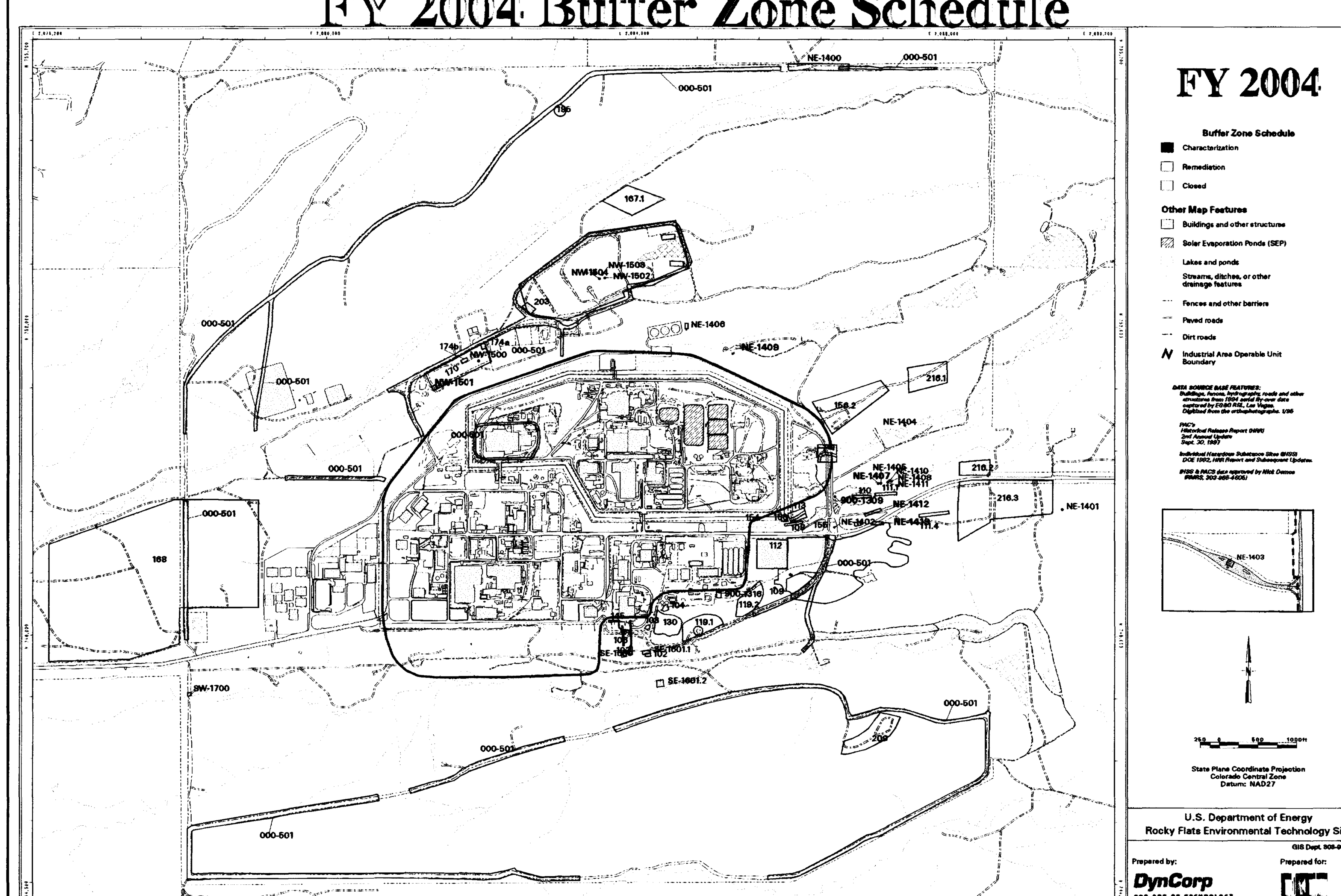
FY 2002 Buffer Zone Schedule



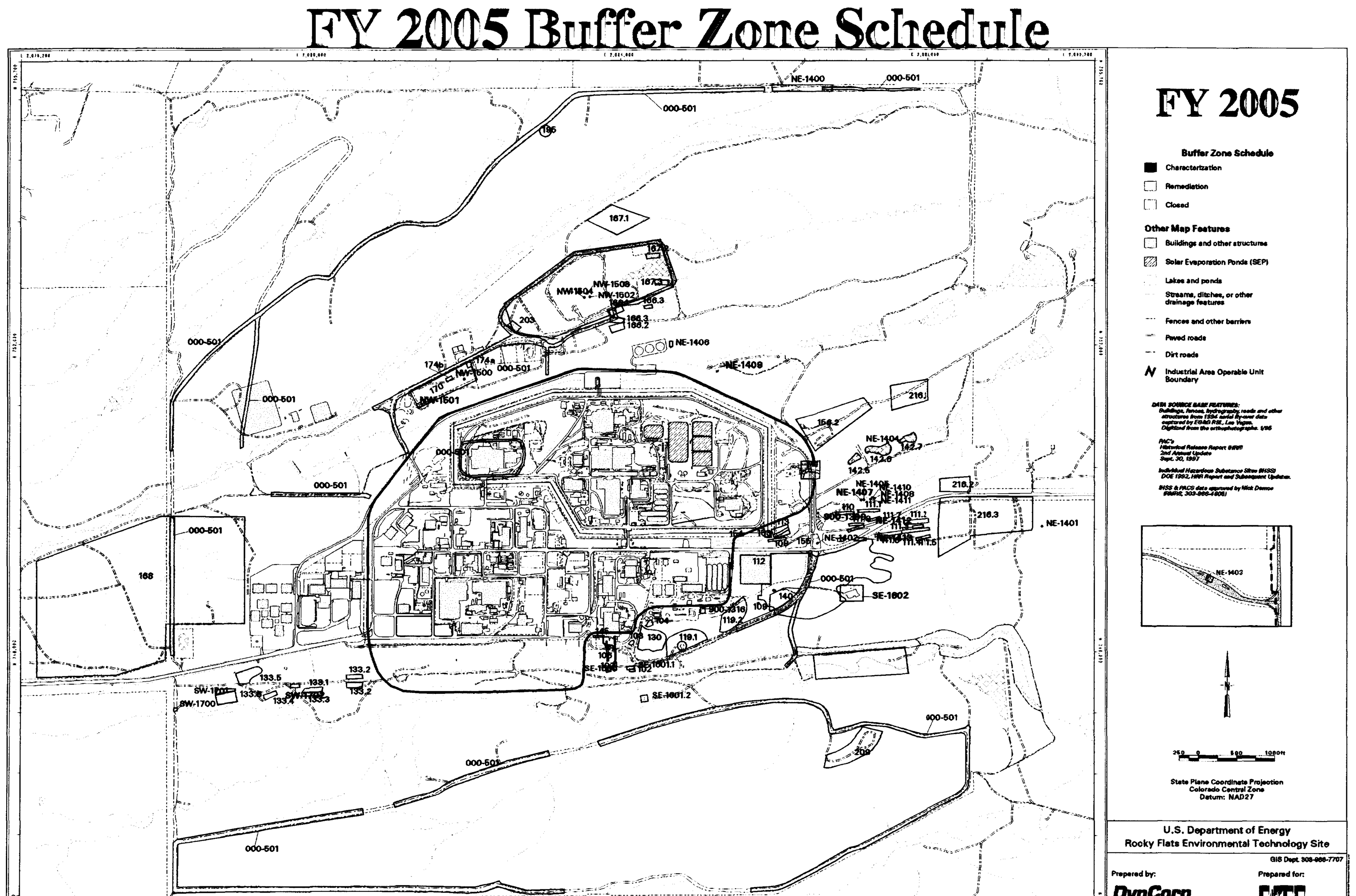
FY 2003 Buffer Zone Schedule



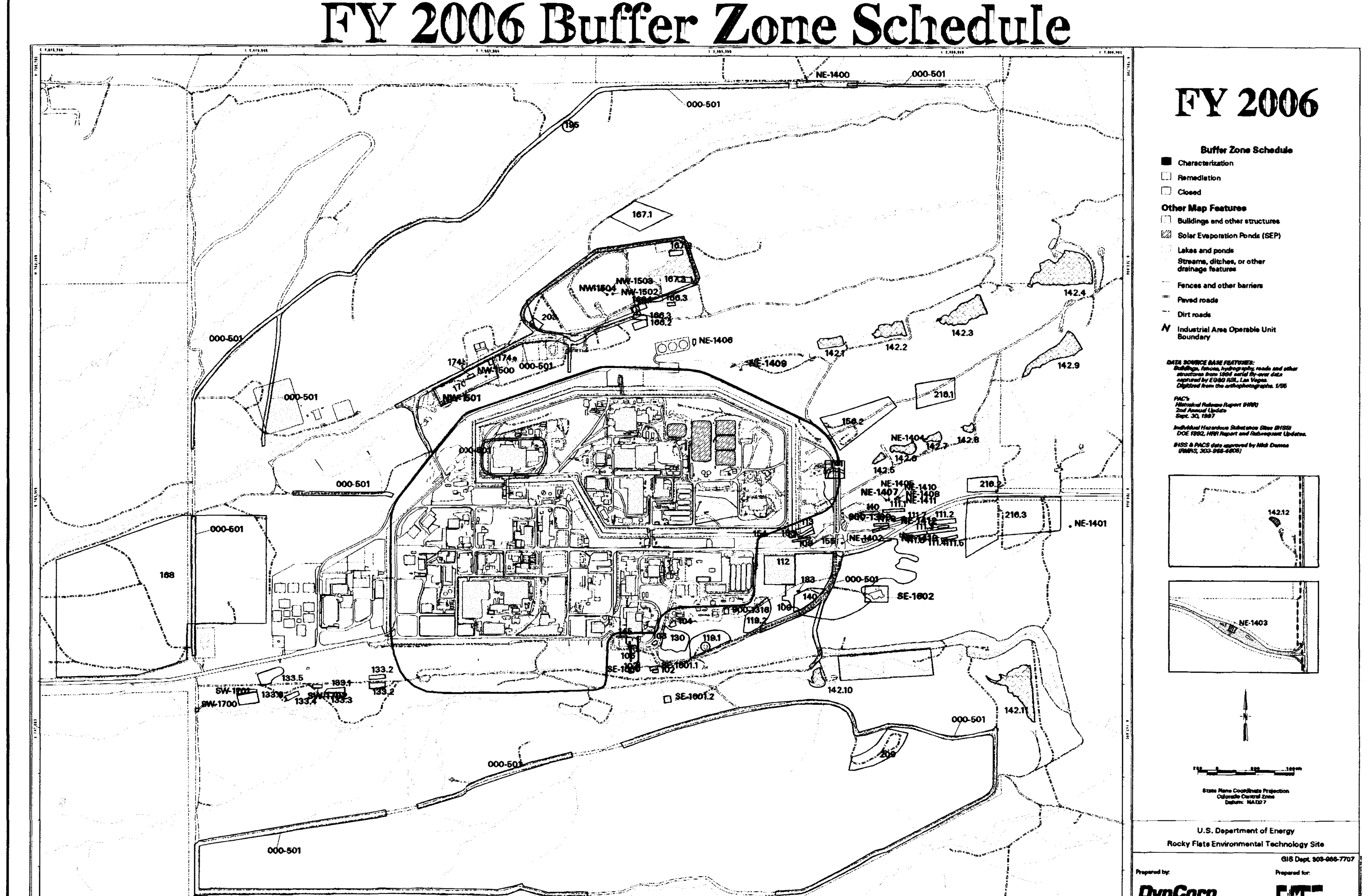
FY 2004 Buffer Zone Schedule



FY 2005 Buffer Zone Schedule



FY 2006 Buffer Zone Schedule



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DynCorp
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COMPANY

Figure 16
Industrial Area Schedule

SW-A-004355

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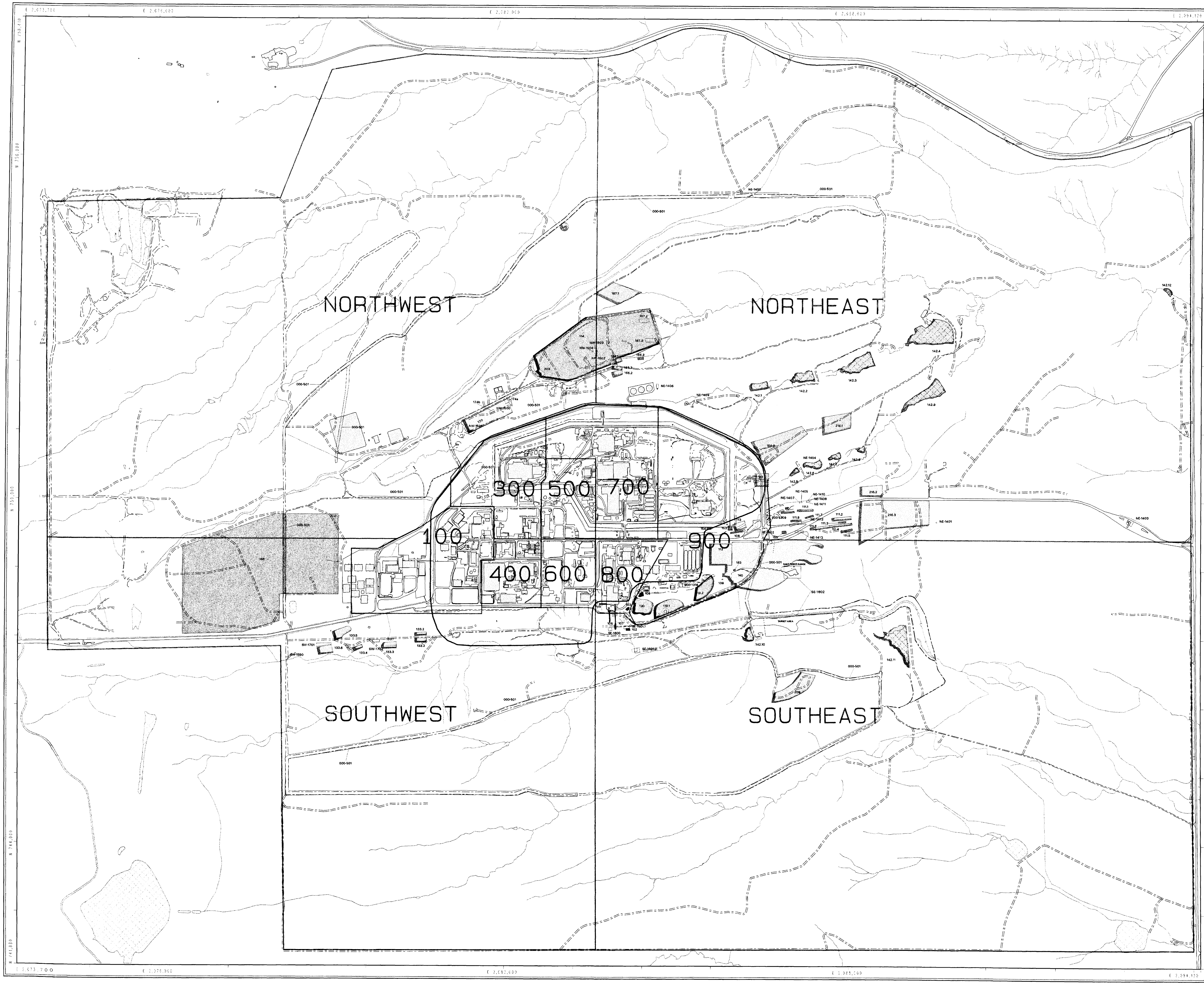

Figure 4

Buffer Zone IHSS & PACs

EXPLANATION

- BZOU
- OU1
- OU5
- OU6
- OU7
- OU11
- OU16
- PAC
- HRR Zone Boundary
- Industrial Area Boundary

Standard Map Features

- Buildings and other structures
- Lakes and ponds
- Streams, ditches, or other drainage features
- Paved roads
- Dirt roads

DATA SOURCE BASE FEATURES:
Buildings, fences, hydrography, roads and other structures from 1994 aerial fly-over data captured by EG&G RSL, Las Vegas. Digitized from the orthophotographs. 1/95

Scale = 1 : 8030
1 inch represents approximately 669 feet

500 0 1000 2000ft

State Plane Coordinate Projection
Colorado Central Zone
Datum: NAD27

U.S. Department of Energy
Rocky Flats Environmental Technology Site

GIS Dept. 303-966-7707

Prepared by: DynCorp THE ART OF TECHNOLOGY

Prepared for: KAISER•HILL COMPANY

MAP ID: 01-0267

July 03, 2001

SW-A-004355